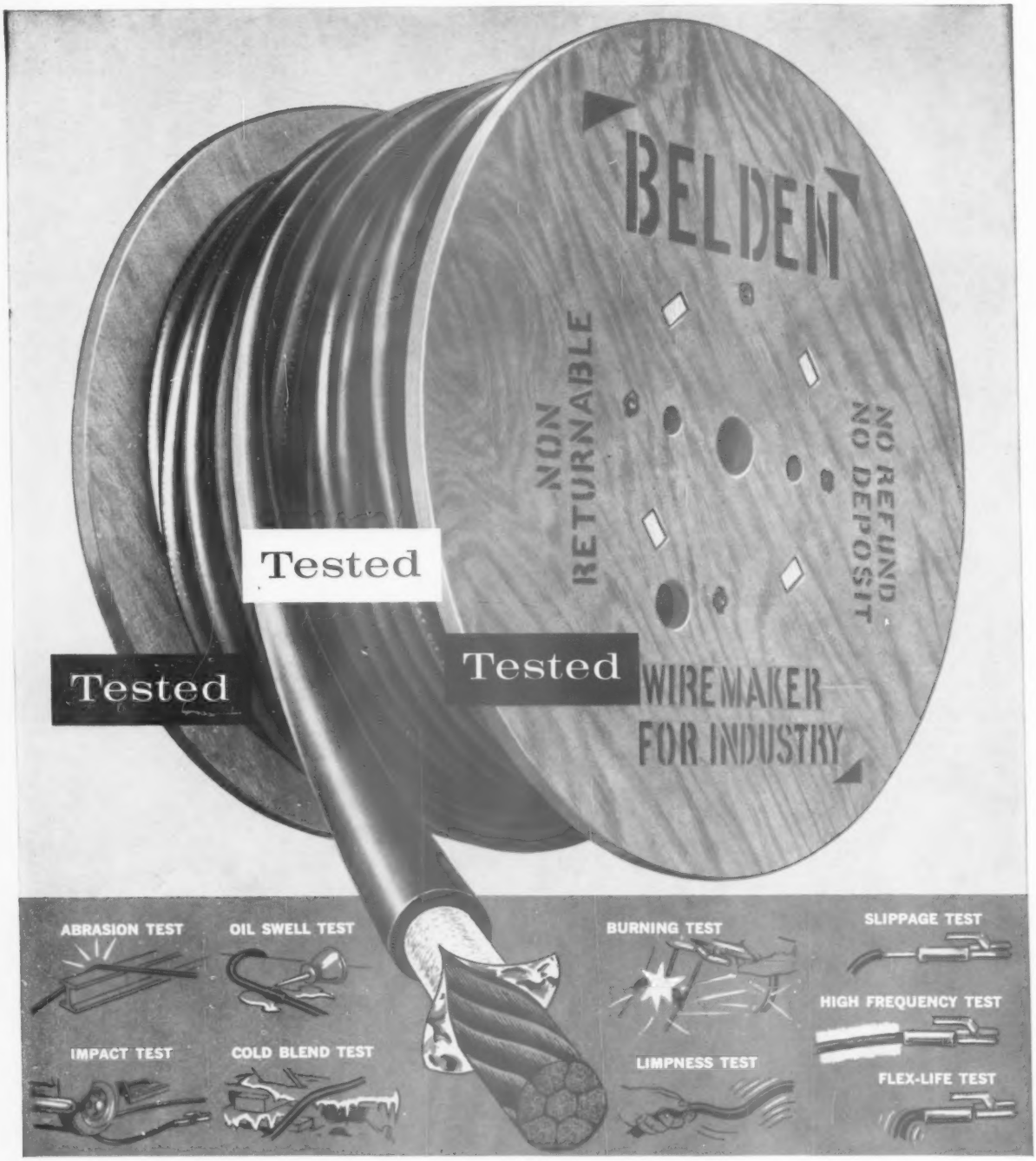
OCTOBER, 1961
50 Cents

Welding Engineer



Welding Cable by

By endless testing under every adverse condition, Belden engineers have developed a welding cable with greater limpness, flexibility, and toughness, that provides years of longer service life. And there is a Belden cable for every welding requirement . . Oil Tempered Rubber Jacketed . . Neoprene Jacketed . . HVF Vinyl Plastic Jacketed . . Whip Lead, Super-Flexible and Neoprene Jacketed . . Neocote colors for identification . . Rubber Jacketed Welder Supply Cords.

Available in many ready-to-use packaged lengths

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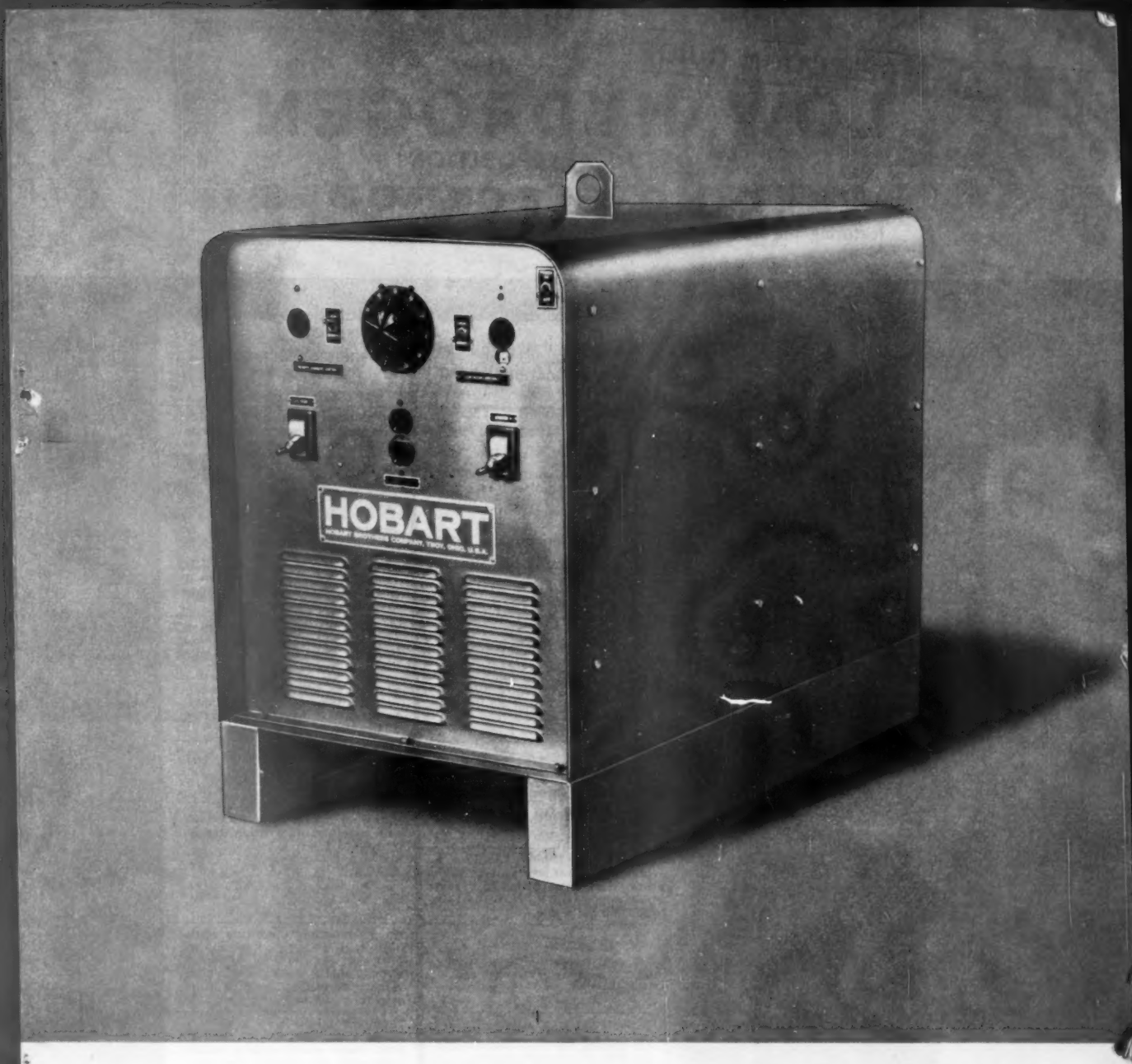
magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • control cables • automotive replacement wire and cable

18-1-1



Model RL-314-S Silicon DC Rectifier Welder

New "Lowboy" welder is packed with production-improving features:

- Unitrol—an exclusive single dial controls a current range that is wider than any other welder of its size. Entire range can be controlled remotely.
- Positive striking, smooth, tenacious arc has low spatter loss.
- Permanently sealed silicon rectifiers provide superior corrosion resistance, long trouble-free life, cut power costs.
- Equipped with magnetic contactor, receptacle and local-remote switch at no extra cost, permitting remote on-off operation.
- Exceptionally quiet operation—has no moving coils or cores.
- Can also be used for cutting, gouging.
- Duplex outlet provides 115v. AC current for hand tools.
- Conserves space by fitting under benches, or by stacking one unit on top of another.
- Available in 300 ampere (32" high, 21" wide, 39" deep) and 400 ampere (33" high, 24" wide, 44" deep) models.

Visit us at the
METAL SHOW
space 720

HOBART
WELDERS · ELECTRODES

... for more complete information write for data sheet A-133-E
Hobart Brothers Company, Box U-101, Troy, Ohio

For more facts Circle No. 151 on Welding Info-Aid Card

HOBART SELECTION GUIDE

LOW HYDROGEN

(AC OR DC ALL POSITION)

WELDING ELECTRODES

featuring the most versatile electrode you can use—the Hobart LH-718

The increasingly popular Hobart LH-718 is an excellent choice for welding low, medium and high carbon steels—even certain low alloy steels. It has an entirely new coating formula—provides easy arc striking—welds at higher AC or DC amperages—deposits metal smoothly and has excellent impact value.

TYPICAL WELDING APPLICATIONS	PROPER ELECTRODE DESCRIPTION	HOBART TRADE NAME
To weld low, medium, and high carbon steels as well as certain low alloy steels.	Outstanding all-position usability; arc smoothness; and ability to deposit crack resistant weld metal.	Hobart "16"
	An electrode with high-lime coating containing iron powder, which in this grade promotes arc smoothness.	LH-718
	Similar to LH-718 but with an addition of approximately 0.50 Molybdenum.	LH-718-MO
To weld 1% nickel steels; also other low alloy and carbon steels where tough welds at sub-zero temperatures are required. For MIL-8016 & 8018 requirements, respectively.	Smooth arc and excellent all-position usability. Designed to meet military requirements.	LH-816-N3
	An electrode with high-lime coating containing nickel and iron powders. Designed to meet military requirements.	LH-818-N
For welding 2¼% and 3½% nickel steels, respectively.	Electrodes with high-lime coatings containing sufficient metal powders to insure outstanding all-position usability.	LH-816-N1
		LH-816-N2
For welding 1¼% Cr-½% Mo steel.	High-lime chrome-moly electrodes with excellent all-position usability.	LH-816-CM
For welding 2¼% Cr-1% Mo steel.		LH-916-CM
		LH-915-CM
For welding Timken "17-22-A"S steel or other medium carbon, low alloy high strength steels normally heat-treated in the 140-240,000 psi range.		LH-CMV
To weld low alloy steels in the 90,000 psi tensile strength range.	An all-position electrode with high-lime coating; has metal powders required to produce strong, ductile weld metal which retains toughness even at sub-zero temperatures.	LH-918
For welding low alloy steels in the 100,000 psi strength range.	Excellent all-position usability; produce sound, strong, ductile weld metal which retains notch toughness at sub-zero temperatures.	LH-915
		LH-1015
For welding HY80 and "T" steels, and other low alloy high strength steels in the 110,000 psi range.	A high-lime coated electrode with sufficient metal powder to deposit weld metal with the room temperature strength, ductility, low temperature toughness, in addition to the iron powder content required by military specifications.	LH-1118
For welds, to be left in the as-welded condition, in steels of the 100 and 120,000 psi strength classes, respectively; also for grades 230 and 260 military applications, respectively.	Smooth arc operation, excellent all-position usability; designed to meet military requirements.	LH-1018 LH-1016
		LH-1215 LH-1218

HOBART WELDERS · ELECTRODES

HOBART BROTHERS COMPANY, BOX U-1011, TROY, OHIO — Phone FE 2-1223

Manufacturers of the world's most complete line of arc welding equipment

International Sales, Hobart Brothers A.G., Box 5500, Nassau, Bahamas

For more facts Circle No. 152 on Welding Info-Aid Card

This is welding: October, 1961

Welding Engineer

The magazine of joining and severing of materials

Welding fumes — simple precautions will protect you 37
Gases, fumes and dust which result from welding operations can cause various illnesses — unless you observe the simple rules of ventilation as outlined in this article.

How to select proper eye shielding 39
Radiant energy must be controlled effectively to prevent serious eye damage. With a proper shield, as described by **R. E. Little** and **G. H. Schauweker**, you can be comfortable as well as protected.
★(For a reprint of this article, circle number 249 on Welding Info-Aid Card.)

Are you using proper welding gloves? 42
Primary purpose of a glove is protection against heat, sparks and metal flow. But choice of the right glove for a specific welding application depends on many factors, as detailed by **Robert B. Medvin.**
★(For a reprint of this article, circle number 250 on Welding Info-Aid Card.)

A welding engineer defends codes as vital to progress 46
Do code restrictions prevent continued growth of the welding industry? No, says Chief Welding Engineer **R. H. Hoefler.** Rather, we can better advance welding by assisting in uniform enforcement of codes and by furnishing complete results of unbiased development to code committees.

Adhesives may solve your bonding problems 70
Adhesives are gaining increased attention everyday. But before you make plans to use this bonding process, you should know the inherent advantages and disadvantages, as described by **H. R. Butzlaff** and **K. F. Charter.**

Also in this issue:

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Detroit to host 43rd Metal Congress and Exposition 54
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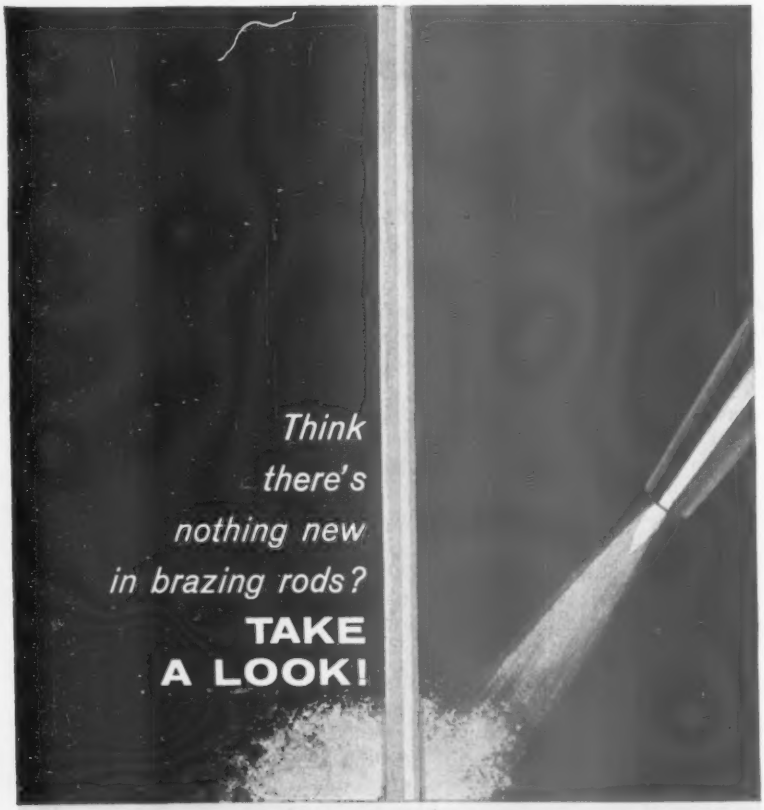

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Here's a new flux-coated manganese bronze filler rod that gives you noticeably better braze-welding of steel, cast and malleable iron, copper and its alloys.

Ampco-Brāz 2FC has an extruded flux coating that is smooth and dense. Result: uniform, free-flowing deposits with excellent tinning action that produce high-strength joints.

Ampco-Brāz 2FC is also perfect for build-up application — on bearing, wear, and corrosion resistant surfaces on steel and cast iron parts. Overlay deposit hardness runs 80-110 BHN (500kg.)

So why not step up to Ampco-Brāz 2FC? Call your Ampco distributor today. Or, write for information — use coupon below.

And don't forget these other Ampco brazing products...

AMPCO-BRāZ No. 1
Low-fuming, high-strength, high nickel-silver rod for joining and overlay with the oxy-acetylene process. Bonds readily to copper-, iron-, and nickel-base metals.

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Low-fuming, manganese bronze rod with nickel added. For brazing high-strength bronzes, brasses, steel, cast iron, and malleable iron with the oxy-acetylene process.

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Saves time on general welding, cast-iron welding, and brazing. Provides dense, sound deposits. Easily removed. Non-fuming, non-toxic. Excellent wet-ability.

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W-186

WELDING ENGINEER

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interests of welding and its allied industries since 1898.

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WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

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For more facts Circle No. 154 on Welding Info-Aid Card→

NEW Dockson GAUGELESS REGULATORS for every purpose!

A simple turn of the "T" handle on the micrometer-type pressure regulator cap quickly sets and maintains desired working pressure.

Fully protected, positive-reading, damage-proof indicator rod fills viewing hole when tank is full, retracts as tank empties. When tank is empty, the rod disappears from view.

Each regulator is carefully tested and individually calibrated. Adjustment scales are clearly etched on the bonnet for permanent, easy reading.

Single-Stage Model #61

Heavy-duty solid forged brass bodies and bonnets.

SAFE, RUGGED, ACCURATE!

- **Unharmed by normal blows and falls.**
- **Saves money on maintenance cost.**
- **Popularly priced for the budget buyer.**

Rough handling, bumps, and falls don't faze Dockson's rugged, new, all-metal gaugeless regulators. Backed by over thirty years of engineering experience, and using only the finest material available, Dockson engineers have designed these economical regulators to give you better service, over a longer period of time, at prices below the cost of conventional glass-faced gauge regulators. A minimum of moving parts; self-aligning, easily replaceable seats; dependable safety valves; sensitive, sturdy metal diaphragms which work WITH, not against pressure — all add up to savings for you. Available in single-stage (#61) and two-stage (#261) models.

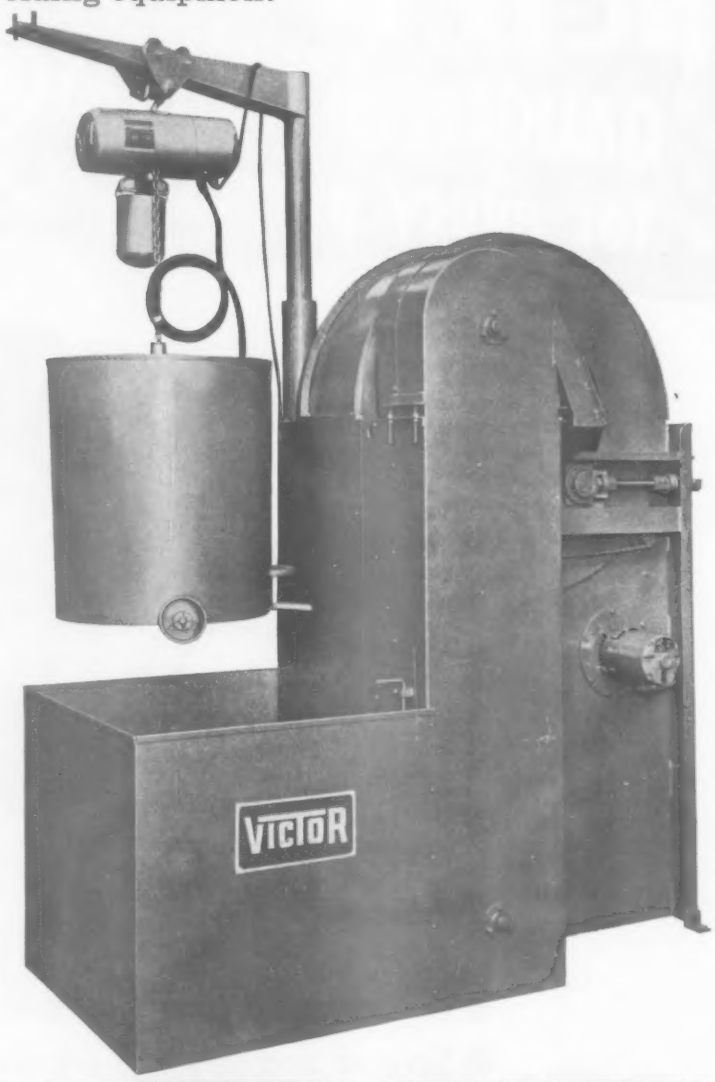
There's a Dockson regulator to suit your every need. Write for detailed literature.

Dockson CORPORATION

3839 WABASH AVE • DETROIT 8, MICHIGAN

To users of submerged arc welding equipment

NOW! Reclaim both hardfacing and mild steel fluxes with VICTOR GRINDER



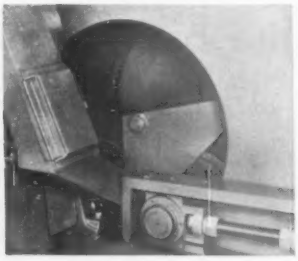
Completely automatic feed on Victor's new model flux grinder eliminates hand loading... removes tramp metal from and reclaims up to 80% of used flux . . . delivers as much as 1200 pounds hourly of re-ground flux, sized to factory specifications.

"Paid for itself in six months," says an owner of our previous model. Not bad, but you'll find this new, improved Model FG 200 even better. Here's why –

- Boom and electric ¼-ton hoist cut out hand lifting flux buckets.
- Self-loading hopper and conveyor eliminate manual feeding, assure a steadier and larger flow of flux.
- Three magnetic separators (2 more than before) trap and remove 90% or more of spatter and tramp metal.
- You get up to 1200 usable pounds hourly of either hardfacing or mild steel flux, so free of contaminants you can scarcely tell reclaimed from new.

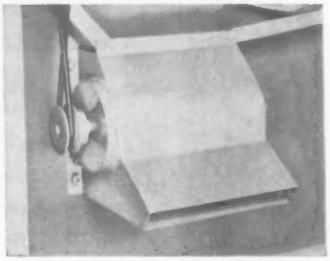
Why pay outsiders 4 to 5¢ a pound to regrind flux and lose half of it in the process, when a Victor improved flux grinder pays for itself? Order from your Victor dealer now. He's your one-stop source for welding and hardfacing supplies.

HOW VICTOR FREES FLUX AND TRAPS METALS



Primary magnetic separator removes most of loose metal as used flux feeds into crusher rolls. Hinged cover lifts for easy cleaning.

Here two hardfaced rollers crush fused flux, thus freeing all metal so second magnetic separator can pick it up as flux flows on.



Final magnetic separator at output spout catches last remaining metal particles. No wonder the Victor makes re-usable such a high percentage of fused and used flux.

VICTOR for welding

VICTOR EQUIPMENT COMPANY

844 Folsom Street · San Francisco 7

3821 Santa Fe Avenue, Los Angeles 58 · 1145 E. 76th Street, Chicago 19

Mfrs. of roller and idler rebuilding machines; high pressure and large volume gas regulators; welding & cutting equipment; hardfacing rods; blasting nozzles; cobalt and tungsten castings; straight-line & shape cutting machines

EG-R

October Headlines

TRAILER, above, carrying Miller welders equipped for demonstration is making a nationwide tour of distributors. One recent stop, below, was at Johnson Welding Equipment Co., Inc., Chicago.

Miller takes welding show on nationwide distributor tour

Housed in the big 35-ft semi-trailer pictured above, a "Roadshow of Welders" is making a nationwide tour for the Miller Electric Manufacturing Co., Inc., Appleton, Wis.

The trailer containing 13 welders for demonstration is stopping wherever a Miller distributor wants to demonstrate the equipment to his customers. At each stop, the Roadshow is equipped to handle 10 live demonstrations including Mig, Tig, manual arc and hardfacing.

The show has already passed through Minnesota, Wisconsin and Chicago and has headed east for Michigan.

The electrically heated and ventilated aluminum trailer includes a built-in welding booth for inside demonstration and a 35 ft by 8 ft canopy which can be set up outside the trailer for cutting, gouging and heavy metallic arc welding.

At each stop, demonstration hours are from 1 to 5 p.m. and 7 to 9 p.m.

Over 12,000 expected at safety congress, show

The 49th annual National Safety Congress and Exposition will again be held in Chicago, Oct. 16-20. More than 12,000 persons are expected to attend.

During the five-day convention some 900 chairmen, speakers, moderators and panelists will take part in the various sessions scheduled in seven of the downtown hotels.

At the main convention hotel, the Conrad Hilton, nearly 200 firms — many of them manufacturers of welding safety equipment — will display the latest in products designed to promote industrial safety.

NCG holds western regional sales meeting

A western regional sales meeting of the industrial department of the National Cylinder Gas Div., Chemetron Corp., was held last month in San Francisco.

B. C. Johnson, San Francisco district manager, was coordinator of arrangements for the meeting.

New firm to make welding supplies

Welding Products Corp., 17 Bertel Ave., Mt. Vernon N.Y., has been formed to manufacture and distribute welding cable, welding hose, safety equipment and related items throughout the United States.

The national sales manager for the new firm is Stan Schumann.

Electrical Manufacturers to hold annual meeting

The National Electrical Manufacturers Association will hold its 35th annual meeting on November 16 at the Plaza Hotel in New York City.

The Association is composed of 500 member companies.

Harris torches cut huge British ship

Approximately 200 cutting torches made by Harris Calorific Co., Cleveland, are being used to reduce the 44,500-ton H.M.S. Vanguard to scrap.

Britain's largest battleship is being turned to scrap by Shipbreaking Industries Ltd., Faslane Port, England.

Grinding Wheel Institute begins safety program

With no expense or obligation involved, the Grinding Wheel Institute, Cleveland, is offering technical assistance in grinding wheel safety education to each of the United States.

The Institute is now providing a technical expert to the State of Florida to meet with the safety personnel of the Department of Industrial Safety to help establish a safety education program.

General American opens welding development lab

General American Transportation Corp., Sharon, Pa., is opening a new welding development laboratory at their plant in East Chicago, Ind.

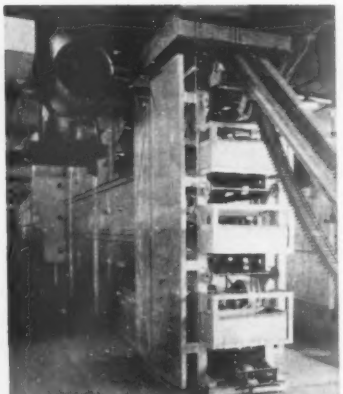
The laboratory will be headed by O. H. Kuhlke who will be located in the Chicago district as director of welding research and development.

Babcock & Wilcox moves 2 district sales offices

The Babcock & Wilcox Co., New York City, has moved its sales offices in Philadelphia and Los Angeles.

The new Philadelphia office is in Suites 1919-21, The Packard Building, 15th and Chestnut Sts. The Los Angeles office is now in the 94 South Los Robles Building, Pasadena.

Electrode oven



THIS 50-ton electrode baking oven has been installed at the York, Pa., plant of The McKay Co. The huge oven doubles Existing capacity for baking low hydrogen electrodes.

Derrick boat gets new bottom

PREFABRICATED 60-ton bottom section is floated under Army derrickboat in floating dry dock at Dravo Corp.'s Wilmington, Del., marine repair yard. Dock was partially submerged to permit welding of new section to vessel.

Eutectic sponsors weldors' clubs

National and regional weldors' clubs are now being organized and sponsored by Eutectic Welding Alloys Corp., Flushing, N.Y.

The clubs are designed to serve weldors who are concerned with non-technical welding.

Membership is open to weldors, welding students, welding instructors and others concerned with welding. Information on the clubs can be obtained from J.G. Magrath, President, Eutectic Maintenance Weldors' Club, 40-40 172nd St., Flushing 58 N.Y., or 5051 Cote de Lisse Rd., Montreal 9, P.Q., Canada.

Linde offers papers on electric welding

Linde Co., 270 Park Ave., New York 17, N.Y., is offering a series of papers on electric arc welding. The papers are free of charge.

Papers include such subjects as Mig welding, Tig welding, CO_2 flux welding, submerged arc welding, plasma arc processes, and shielding gases.

Hobart offers courses for supervisors

Four workshop courses for supervisory personnel will be conducted again this fall by Hobart Technical School, Troy, Ohio.

Each 5-day course will deal with fusion welding operations.

The course to be offered are: Arc Welding Inspection and Quality Control, Oct. 9-13; Welding Fundamentals for Supervisors and Engineers, Nov. 13-17; Automatic Welding for Management, Nov. 27-Dec. 1; and Gas Shielded Arc Welding Processes, Dec. 4-8.

Registration for each course is $50 per man. Registration and general information can be obtained from the School Director, Hobart Bros. Technical School, Troy, Ohio.

(More news on page 79)

COMING EVENTS

OCT. 9-10: NWSA West Central Zone Meeting, Radisson Hotel, Minneapolis.

OCT. 12-13: NWSA Western Zone Meeting, Riviera Hotel, Las Vegas, Nev.

OCT. 16-20: National Safety Congress and Annual National Safety Council Convention, Chicago.

OCT. 19-20: 16th Midwest Conference, American Society for Quality Control, Chase-Park Plaza Hotel, St. Louis.

OCT. 23-25: Fall Meeting, Abrasive Grain Association, Waldorf-Astoria Hotel, New York City.

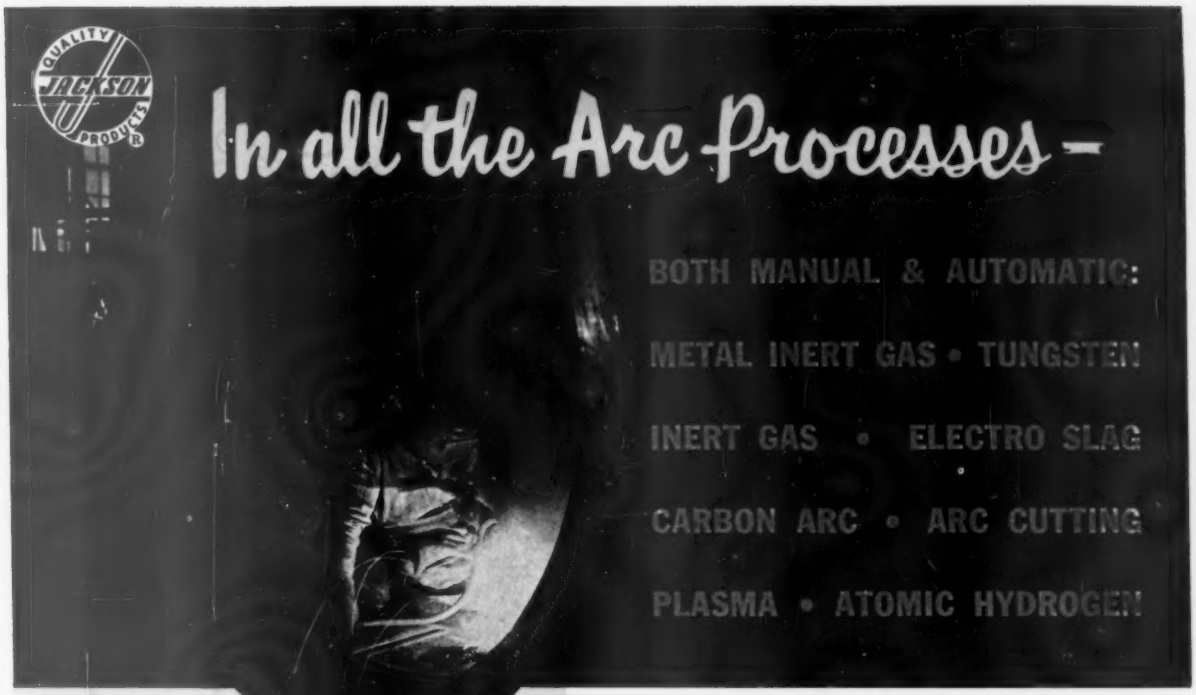
OCT. 23-27: 43rd National Metal Congress, American Society for Metals, Cobo Hall, Detroit.

DEC. 4-6: Winter Meeting, Independent Oxygen Manufacturers Association, Alffer Hotel, Mexico City.

NOV. 1-3: 1st International Congress on Experimental Mechanics, Hotel New Yorker, New York City.

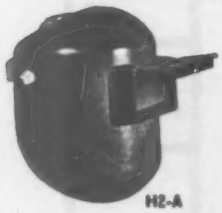
NOV. 7-9: 8th Industrial Electric Exposition, Electric League of Western Pennsylvania, Penn-Sheraton Hotel, Pittsburgh.

NOV. 16: 35th Annual Meeting, National Electrical Manufacturers Association, The Plaza Hotel, New York City.



Jackson Helmets
Do their Job

Just pick what's best for you—Jackson offers twenty different models. Choose the shape you like, the material you like, the lens holder you like. Add Jackson's non-conductive friction pivots, all-nylon Adjust-O-Lok headgear, and adjustable helmet stop. Check on the quality Jackson line soon.


H2-A

Curved Shell Fiber Glass
With Choice of three lens holders.
Shown: handy plastic lift-front type.

Curved Shell Vulcanized Fiber
With choice of three lens holders.
Shown: front-loading metal holder.

H-10A

H2-AP

Narrow Shell Fiber Glass
With choice of three lens holders.
Shown: non-conductive plastic holder.

Straight Shell Vulcanized Fiber
With choice of three lens holders.
Shown: non-conductive plastic holder.

H-80AP

H9-A

Straight Shell Fiber Glass
With choice of three lens holders.
Shown: handy lift-front type.

Left: Five different handshields are available.
Right: All Jackson Helmets may be bought in combination with any of three Jackson safety caps.

FREE CATALOG!
Sixteen page welding and safety equipment catalog – Write today!

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

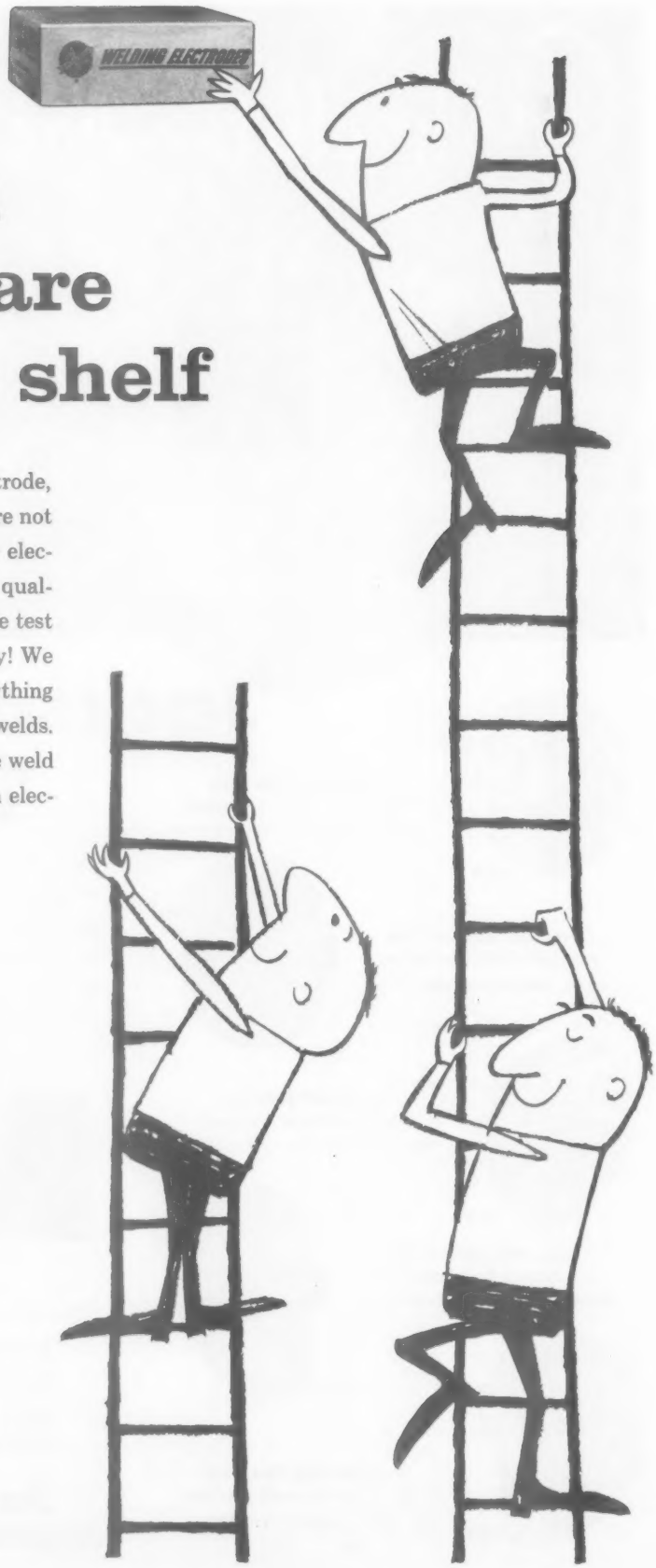
5523 Nine Mile Road, Warren, Michigan

For more facts Circle No. 156 on Welding Info-Aid Card

A. O. Smith electrodes are strictly top shelf

When you reach for an A. O. Smith electrode, you've reached a high point in quality. We're not stretching that point when we say that our electrodes are backed by the industry's strictest quality control program. We test 'em by eye! We test 'em mechanically! We test 'em electronically! We weld test 'em after baking. We do everything humanly possible to assure top performance welds.

We think we know a good thing when we weld with it. You will too when you reach for an electrode made by A. O. Smith.



Through research ... *a better way*

A.O.Smith
CORPORATION

WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
A. O. Smith INTERNATIONAL S. A.
Milwaukee 1, Wisconsin, U. S. A.

Your October, 1961

Weld World

As WE went to press, these were the industry's latest developments:

. . New liquid nitrogen-liquid oxygen plant built for Liquid Carbonic Div. of General Dynamics will go on stream November 1. Target date originally was January 1, 1962. Tewksbury, Mass., plant will also produce liquid argon, and will serve as New England distribution center for all three products.

. . National Electric Welding Machines Co. reported its sharpest upswing in 18 months in original equipment sales. Orders totaling $1½ million were received by National during June-July--more than half of them from the auto industry.

. . Thick aluminum plate can be welded by new Kaiser Aluminum & Chemical Corp. method utilizing large-diameter filler wire. Economy and efficiency are claimed for the method, which can give an average deposition rate of 15 lb per hour (over 20 on special applications). Method uses wire up to 7/32-in. in diameter; Mig equipment usually is limited to 1/8-in. wire -- normally employs a 1/16-in. size. Kaiser has welded 3-in. plate in 5083 and 5456 aluminum . . . has also noted ductility increase.

. . LP gas output in August soared 19% over same period in 1960. Production rose from 307,064,000 gal a year ago to 379,587,000 in 1961.

. . Wrought copper and copper alloy products are subject to new designation system devised by Copper & Brass Research Ass'n. System is numerical and limited to three digits to avoid conflict with four-digit designations in use for steel and aluminum. It's now applied to more than 100 commercially important wrought coppers and alloys.

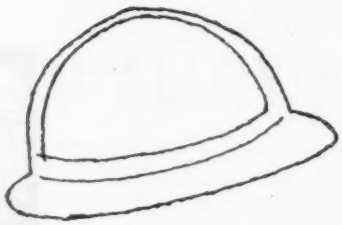
. . Russia announces development of steels that can withstand four times the deformation and three times the elongation of conventional types. New steels reportedly gain these characteristics through exposure to supersonic vibrations while in molten state.

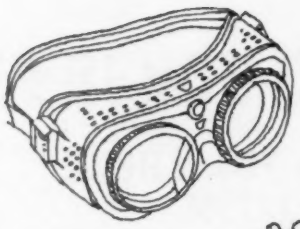
. . Latest in a series of expansion moves by Air Products, Inc., Allentown, Pa., involves purchase of Delta Oxygen Co., of Memphis. Delta is one of the South's largest independent oxygen manufacturers and distributors.

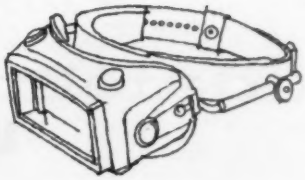
. . Haynes Stellite Co. has introduced a new weldable high-strength columbium-base alloy containing tungsten and zirconium. Known as CB-752, it has ultimate strength of over 25,000 psi at 2,400 F.

Proper

High quality personal protective equipment for welding, brazing and cutting, manufactured by American Optical Company, is now available through NCG's nation-wide network of sales offices, distributors and dealers.

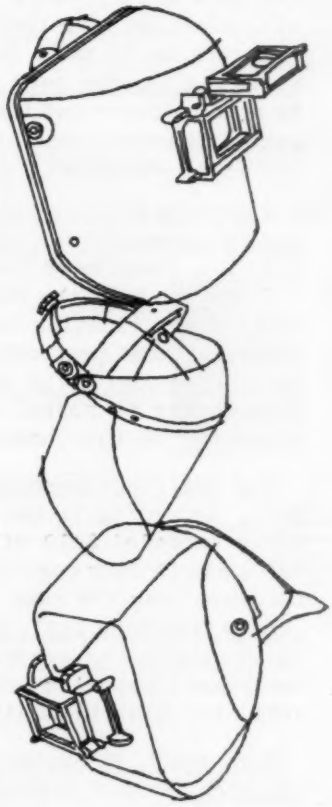






protection

keeps me happy



No one wants an accident—but just in case—*proper* protection, can prevent painful, costly injuries that often cause serious disabilities. Insurance does help, but no matter how much money is received as compensation, it is small return for the permanent damage that could have been avoided.

Your working skills and general well-being must be carefully protected. *Just any old* kind of protection won't do. Different jobs require different kinds of protection. The proper kind of protection for your welding, brazing and cutting jobs is available from your nearby NCG distributor or dealer. Send today for NCG Catalog N-177-E-2K.

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dateline: WASHINGTON

The President's tax reform bill was formally postponed until next year – and along with it the proposed tax credit plan which would have permitted tax deductions for earnings plowed back into new machinery and equipment.

What killed the bill? One major factor was Berlin. As mentioned on this page last month, the likelihood of increased, taxes to pay for stepped-up defense spending hovered ominously over the House Ways and Means Committee's proceedings. This possibility of more taxes for one group of taxpayers, measured against a definite tax cut for a second group, was too big a pill for legislators to swallow with election year 1962 facing them.

According to some Capitol observers, however, both sides of the political aisle realize the need for such legislation. With re-examination of the proposals by both industry and the White House indicated, and promised priority for next year's Congressional session, depreciation reform may get a second and better chance at passage.

* * * *

A pending administration bill would let the Federal Trade Commission ignore the "fundamental concept that everyone is innocent until proved guilty," the U. S. Chamber of Commerce stated recently.

Under the bill the FTC, which enforces federal anti-trust, advertising and price discrimination laws, could get courts to enforce its cease and desist orders without presenting any proof of a violation of the laws. The orders would be enforced until the cases had been decided – which sometimes takes years. Opportunity to appeal FTC decisions to the courts would also be denied, according to the Chamber.

* * * *

The small business community's share of Government contracts continues to grow. According to the Small Business Adminstration, prime contracts to small firms exceeded $219 million in June, a 27% increase over those awarded in June, 1960. And in July contracts valued at nearly $121 million were awarded, a 32% increase over the same month last year.

In fiscal year 1961, SBA registered the greatest number (34,272) and value ($1.2 billion) of contracts in the agency's history. In cooperation with 13 Government agencies and installations, SBA earmarks proposed purchases for exclusive bids by small firms.

* * * *

What can U. S. business do to help counter the Communist anti-capitalist campaign? Expand international trade in the free world, according to Richard Wagner, president of the U. S. Chamber of Commerce.

During a recent trip he discussed the subject with West European businessmen and government officials. These experts "have a very definite belief that trade all over the world must expand in the free nations, particularly if we are to meet the Soviet challenge."

At the time of his appointment, Wagner also stated: "Never has it been more important for U. S. businessmen to seek and develop foreign markets. Only a few years back, America was the only major source of supply for many items at any price. Today, our country is but one among many vigorous trading nations."

BRAZING ALLOY REFERENCE CHART

SILVALOY BRAZING ALLOYS

SILVALOY	NOMINAL COMPOSITIONS					Solidus °F	Liquidus °F	Density troy oz /cu in
	Ag	Cu	Zn	Cd	Other			
5	5	88.75	0	0	P=6.25	1190	1300	4.37
15	15	80	0	0	P=5	1190	1300	4.45
35	35	26	21	18		1125	1295	4.90
45	45	15	16	24		1125	1145	4.92
50	50	15.5	16.5	18		1160	1175	5.00
503	50	15.5	15.5	16	Ni=3	1170	1270	5.00
355	56	22	17	0	Sn=5	1145	1205	5.00
I-401	5	0	16.6	78.4		480	600	4.53
377	5	0	0	95		640	740	4.60
A-4	9	53	38	0		1410	1565	4.50
20	20	45	30	5		1140	1500	4.64
A-11	20	45	35	0		1315	1500	4.68
A-79	25	52.5	22.5	0		1250	1575	4.71
A-13	30	38	32	0		1370	1410	4.67
250	40	30	28	0	Ni=2	1220	1435	4.76
254	40	30	25	0	Ni=5	1220	1580	4.72
A-14	40	36	24	0		1235	1415	4.80
105	45	30	12	0	Mn=13	1298	1298	4.76
A-18	45	30	25	0		1225	1370	4.82
A-25	50	34	16	0		1250	1425	4.99
54	54	40	5	0	Ni=1	1340	1575	5.06
A-33	60	25	15	0		1245	1325	5.02
60	60	30	0	0	Sn=10	1115	1325	5.23
T-50	62.5	32.5	0	0	Ni=5	1435	1590	5.19
Easy	65	20	15	0		1240	1325	5.06
Medium	70	20	10	0		1275	1360	5.14
301	72	28	0	0		1435	1435	5.24
AE-102	72	27.8	0	0	Li=.2	1410	1410	5.22
K-427	75	0	25	0		1300	1345	5.06
T-51	75	24.5	0	0	Ni=.5	1435	1475	5.30
Hard	75	22	3	0		1365	1450	5.28
T-52	77	21	0	0	Ni=2	1435	1525	5.32
A-49	80	16	4	0		1345	1490	5.29
AE-100	92.8	7.0	0	0	Li=0.2	1410	1610	5.46
S-475	95	0	0	0	Al=5	1550	1600	5.73
AT-601	97	0	0	0	Li=3	1115	1235	3.54
AT-600	98	0	0	0	Li=2	1290	1400	4.03

SILVALOY & PRECIOUS METAL ALLOYS

The American Platinum & Silver Division is ready to supply your brazing needs. The alloys listed here are part of the AP&S service. Refer your brazing problems to us for our recommendations, or write to American Platinum & Silver Division directly, or to your local Silvaloy distributor.

Silvaloy compositions include all commercially important silver base alloys and many special purpose compositions. The popular low temperature Silvaloy 35, Silvaloy 45, Silvaloy 15 are included in this group. If other compositions are required they can be supplied on special request.

We Recommend #1200 or Black Flux with Silvaloy Brazing Alloys

Ask for "A Complete Guide to Successful Silver Brazing...."

PRECIOUS METAL BRAZING ALLOYS

ENGALOY PM	NOMINAL COMPOSITIONS					Solidus °F	Liquidus °F	Density troy oz /cu in
	Au	Pd	Ag	Cu	Other			
478		5	68	27		1480	1490	5.31
491		10	58	32		1520	1565	5.30
490		15	65	20		1565	1650	5.45
493		20	52	28		1615	1650	5.41
492		25	54	21		1650	1740	5.51
428		5	95			1780	1850	5.56
431		10	90			1835	1950	5.60
447		20	80			1960	2150	5.67
485		30	70			2120	2250	5.74
238	80			20		1630	1630	8.28
261	75		5	20		1625	1640	7.99
265	72				(Ni=22) (Cr=6)	1785	1835	7.48
242	37.5			62.5		1814	1859	5.90
260	35			65		1832	1870	5.80
243	35			62	Ni=3	1787	1886	5.81
255	82				Ni=18	1742	1742	8.41
129		60			Ni=40	2260	2260	5.58
440		20	75		Mn=5	1830	2050	5.56
441		33	64		Mn=3	2100	2190	5.70

Precious metal compositions provide higher brazing temperatures as may be required for vacuum tube, aircraft, or missile use. These alloys will provide good corrosion resistance and minimum diffusion into base metals. They are ideal for atmosphere brazing.

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For more facts Circle No. 159 on Welding Info-Aid Card

REPAIR and REBUILD
WORN BUCKET PARTS
THIS ECONOMICAL WAY

● Manganal has the greatest toughness, with work-hardened abrasion resistance, of any steel. Protects profits by keeping equipment producing longer . . . with less cost than new parts.

WORN HEAVY-DUTY EQUIPMENT PARTS REQUIRE . . .
HEAVY-DUTY
MANGANAL®
11%-13½% MANGANESE-NICKEL STEEL
ABSORBS IMPACT AND ABRASIVE WEAR LONGER THAN NEW PARTS

BUCKET DOOR-flame cut from Manganal Hot Rolled Plate.
BUCKET DOOR LATCH PIN — cut from Manganal Square Bar.
BUCKET DOOR LATCH PIN BRACKETS — form from Manganal Flat Bars.
BUCKET SIDES — cut from Manganal Flat Bars.
BUCKET CUTTING EDGE FOR WORN LIP — bend from Manganal Hot Rolled Wedge Bar.
BUCKET TOOTH SOCKETS—reinforce with Manganal Round Bars.
BUCKET CUTTING EDGES BETWEEN TEETH — cut from Manganal Hot Rolled Wedge Bars.
BUCKET FLOOR LINER — flame cut and bend from Manganal Hot Rolled Plate.
BUCKET HITCH PINS & HINGE PINS — cut from Manganal Round Bars.
CRACKED BUCKET LIP—repair with Manganal Electrodes for extra strength.
BUCKET HEEL — reinforce with Manganal Flat Bars.
BUCKET TAPERED LIP—form from various thicknesses of Manganal Round Bars.
BUCKET TEETH — repoint with Manganal Wedge Bars.

Available from all welding distributors.
Nearest Distributor Upon Request. Send for Helpful Literature.
STULZ-SICKLES CO.
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Letters

Notable converts

Your editorial "Notable converts," in the August issue, is very interesting.

The welding industry as such does not seem to realize the great possible gains to be made if it concentrates a bit harder on getting a wider use of welding in all kinds of structural steel work involving bridges and buildings.

A short time back we made a survey for a client on the future possibilites for welding in structural work knowing that welding creates steel savings that average 10% in all structures in which welding is used . . .

The results of this study were quite interesting. If those in the welding industry would cooperate to push the use of welding in building structures, at the end of a five year period the industry could expect to sell from then on a yearly average of 35,000,000 more pounds of electrodes and an average of 2,600 additional arc welding machines above the number now sold, to say nothing of all the minor items required for a welding operation.

But as our client said, "who is going to get the welding people together even for their own good."

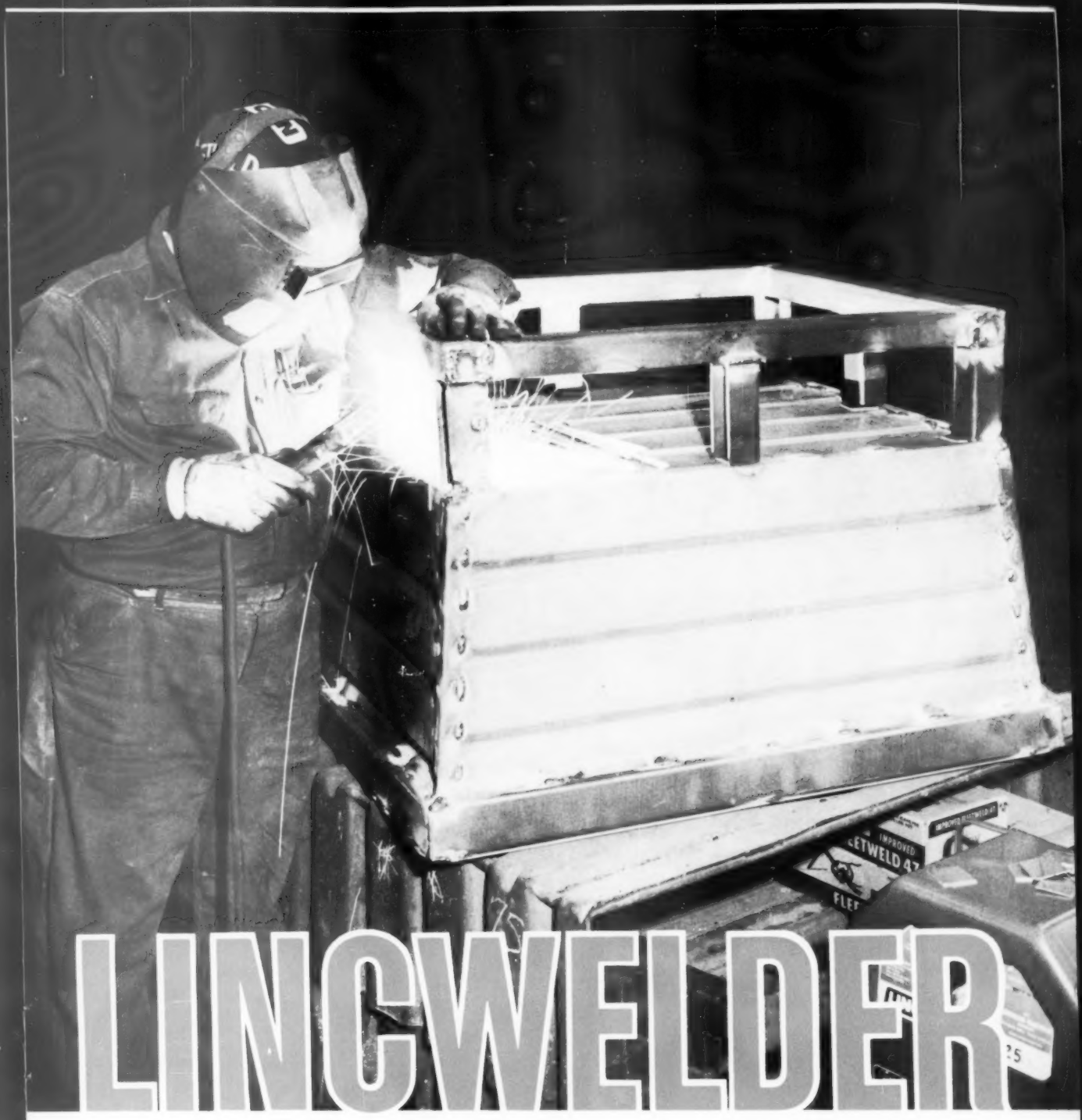
Van Rensselaer P. Saxe
Baltimore, Md.

Aluminum alloy selection

I enjoyed reading your article entitled *Design for Welding* in the WELDING ENGINEER Fact File issue. In the article you did not discuss the use of, or selection of aluminum alloy for welding. Please allow me to offer a paragraph or two on the subject.

The designer of an aluminum weldment must select his alloy on a basis of desired final properties, considering whether weldment size and project cost permit reheat treatment. The highest weld strength efficiency is obtained by using a heart-treatable alloy and

(Continued on page 84)



LINCWELDER

You can use just about any welder made for light fabrication, repair or maintenance welding. You can, that is, if you're not too concerned with the job you'll get or what it will cost. Take a few moments, won't you, to read how Lincoln—**Lincwelders**—are specifically designed for this kind of work and how they can improve weld quality and reduce both your equipment and job costs.

These are LINCWELDERS on the job

Light fabrication is simple with an AC-225-S **Lincwelder** because of its high current capacity, exceptional arc stability and high open-circuit voltage. Lets you handle iron-powder electrodes up to $\frac{1}{8}$-inch in diameter. These usually require a much larger machine. This capability lets you increase production, lower your costs. There simply is no machine made comparable to the AC-225-S, and none which sells at a competitive price which can do so many jobs so well.

Automotive repair shop makes good use of AC-180-S **Lincwelder** for general repair and maintenance work. Machine operates on standard single-phase, 230-volt power, needs no special wiring. Operates all day for about 32¢. Its low initial price and low operating cost means years of low-cost, trouble-free service. Machine furnished complete with headshield, cables, ground clamp, electrode holder, sample electrodes, instructions . . . everything you need to weld.

Lincwelder is a name applied to machines made for light to medium duty fabrication and maintenance. Two of these types of machines are discussed here. First, a DC, motor-generator, the second, an AC, transformer welder.

In the entire history of the welding industry, probably more men have been trained for "light-duty" work on **Lincwelder** motor-generators and have subsequently used them in more kinds of applications than any other welder ever made. Here's a breed of machines that is noted for delivering a sure, steady DC current. Here are machines equipped with dual continuous controls which let the operator set the exact current and voltage settings he needs to do a particular job according to his particular style. This kind of control lets the man get on top of his job quickly, produce better welds—faster—at less cost. These machines are just plain perfect for repair shops, garages, general maintenance departments, wherever DC welding is done on sheet metal, angles, channels and other light materials. And, of course, they can easily handle most stainless, non-ferrous and hardsurfacing jobs, too.

But maybe your shop uses one of the new electrodes that demands AC heat. If this is the case, you can get no finer AC transformer welder for light or medium-duty welding than the **Lincwelder** AC-180-S or the AC-225-S. Thousands of the smaller units have been sold for use in every conceivable type of application from the small captive job shop, the independents, and farms. No wonder. Here is a machine that comes equipped with everything you need to weld . . . electrode holder, ground clamps, cables, headshield, even sample electrodes. Does all kinds of jobs besides welding . . . hardsurfacing, thawing frozen pipes, cutting metal, etc. And the newer, companion AC **Lincwelder,** the AC-225-S, does all these things and more. Why? Simply because it has a higher open-circuit voltage which lets you handle the new, fast iron-powder electrodes in sizes up to 3/16". Low cost? This machine which comes complete—just as the AC-180-S—sells for less than most competitive 180-amp machines.

LINCOLN WELDERS

Why not consider putting one or more **Lincwelders** to work in your shop today? Want more information? See your local Lincoln field engineer . . . he's a specialist in welding. Or write direct for bulletins listed on the next page.

Lincwelder motor-generator sets are equipped with dual continuous controls. These let the operator select the precise heat and voltage settings to suit both his style and the particular task at hand. Here, **Lincwelder** is used on typical repair job on pipe. Many of these machines purchased more than thirty years ago are still operating, still delivering top welding performance. The most elementary sort of maintenance is required . . . usually just a change of brushes is all that is needed to keep them in top running condition.

Most stainless welding electrodes require DC. Here, **Lincwelder** motor-generator delivers steady DC current on stainless-steel sink repair job. But these machines are hard to beat for any welding be it on carbon steels, alloy or stainless steels, as well as non-ferrous metals. In every instance, they assure accurate control of penetration, great arc stability and thus top-quality welds at highest possible speeds. These characteristics assure you of getting low-cost performance.

LINCWELDERS

Motor-Generators—DC

Lincwelders are noted for rugged construction combined with light weight and portability. Available in 180 and 250-amp sizes. NEMA rated at 30% duty cycle, 30 volts. Available for 60 or 50-cycle, 2 or 3-phase supplies. Operating speed is 3600 rpm. For more information, request bulletin 4101.1.

LINCWELDERS

Transformer—AC

Lincwelder transformer machines are made in two sizes, 180 and 225 amps. Both are 20% duty cycle, 30-volt machines, available for 60 or 50-cycle, single-phase power supplies. The AC-180-S is NEMA rated and meets REA requirements for limited input machines. For more information, request bulletins 4601.10 and 4610.1.

THE LINCOLN ELECTRIC COMPANY

Dept. WW-2812 Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment and Electrodes

LINCOLN ...USA

Between passes

un-settling comments

Her name is not Brenda Starr. In fact, we won't even tell you her name. There's a slight chance she may read WE and we don't want to embarrass her But this girl-type reporter for the *Chicago Tribune* gave us all a chuckle recently.

Seems she wrote a feature story about a local area college art teacher—a sculptor who does a lot of work in welded metal. In it she described the tools he works with: "The artist works in the college studio using such equipment as a welding torch, oxygen and a *settling tank*." (Italics are ours).

Comment: In lieu of data concerning performance of aforementioned "oxysettling," we'll stick to acetylene. And we'll continue to hope for the day we'll read a newspaper that doesn't contain an account of how burglars opened a safe with a "welding torch" ... or of how the trapped occupants of an auto or train were freed with an "acetylene torch."

sneak preview

Russia's use of the electroslag process was examined (on film) recently by the staff of WELDING ENGINEER and several members of welding departments of metal-fabrication plants in Chicago and its northern suburbs. Obtained through the courtesy of Arcos Corp. of Philadelphia, U.S. supplier of electroslag equipment, the film was thought to be the only one of its type available in America.

The viewing for staff members and local welding engineers and supervisors is an integral part of WE's education program—a program that starts "at home" and encompasses all those who seek to know more about the family of processes that provide them with a living.

WE's Publisher, Ted Jefferson, receives Public Interest Award granted by National Safety Council for "stressing and emphasizing safety" in this magazine. Award is presented by A. F. Friedman (left) of Niles Township Safety Council. NSC's timing couldn't be better: safety is the theme of this issue.

WE adds two

Jack Flynn has been appointed new Midwest District Manager for both WELDING ENGINEER and THE WELDING DISTRUBTOR. Well-versed in all phases of the magazine field, Flynn most recently served as sales representative for HOUSE BEAUTIFUL, a Hearst publication, and before that he represented SUNSET magazine for nine years. Adding to his space-sales knowhow is the fact that Flynn also has had considerable experience in selling materials to original equipment manufacturers.

To make it a pair, WE has also added Jack Fairlie to its staff. One-time managing editor of WE and TWD, he left for a two-year stint in public relations, and has now rejoined the staff to handle special projects.

ah, there, dieters!

No need to visit Italy this month. Just set yourself for October's International Pizza Week (9-15), National Wine Week (14-21) and National Macaroni Week (19-28). When you've finished, you'll probably appreciate the American Dairy Ass'n.'s two-month promotion, Nature's Nightcap (Oct. 1 - Dec. 31).

new the LIGHTEST and SMALLEST 500 AMP TORCH EVER MADE!

TEC TORCH

NO. 421

- ✓ Smaller and lighter (5.5 oz.) than most 300 amp torches.
- ✓ Exclusive one piece construction guarantees freedom from costly maintenance and parts replacement.
- ✓ Weld continuously from 1 to 500 amps. AC or DC.
- ✓ Exclusive Tip-of-the-Torch cooling reduces operating costs and eliminates "cooling off" time.
- ✓ Uses all standard TEC Vycor nozzles and TEC chucks.

SPECIFICATIONS

Overall length	9 inches
Working weight	5.5 oz.
Handle diameter	1 inch
Work range	1 to 500 amps.
Nozzle sizes available (orifice I.D.)	⅛" to $^{11}/_{16}$"
Nozzle lengths available (overall length)	1¾ to 5¾ inches
Chuck sizes available	.010", .020", .030", .040", $^{1}/_{16}$", $^{3}/_{32}$", ⅛", $^{5}/_{32}$", $^{3}/_{16}$"
Hose lengths available	12½ ft., 25 ft.
Nozzle materials	Vycor (recommended) Ceramic, Pyrex

TEC TORCH CO. INC.

153 UNION AVE., EAST RUTHERFORD, N.J.

new TEC "MINIATURE"

NO. 423

SMALLEST 300 AMP WATER COOLED TORCH EVER MADE

Capable of welding from 1 to 300 amps continuous duty cycle, the Tec "Miniature" torch has been designed especially for welding at high amperages in small restricted areas.

Exclusive Tip-of-the-Torch cooling and one piece construction assure maintenance free operation by eliminating parts replacement and "cooling-off" time.

Exclusive transparent Vycor glass nozzles present gas savings of 25% to 40% over ordinary nozzles and provide complete visibility for greater welding accuracy.

SPECIFICATIONS

Overall height w/electrode	1¼ inches
Overall length	6½ inches
Working weight	2½ ounces
Handle diameter	⅞ inches
Work range	1 to 300 amps.
Nozzle sizes available	⅛" to 11/16"
Chuck sizes available	.040", 1/16", 3/32", ⅛"
Hose lengths available	12½ ft. and 25 ft.
Nozzle materials	Vycor
Electrode length	1 inch

TEC TORCH CO. INC. 153 UNION AVE., EAST RUTHERFORD, N.J.

For more facts Circle No. 163 on Welding Info-Aid Card

For more information, fold out Welding Info-Aid card on page 97 and circle appropriate numbers as you read.

NEW PRODUCTS for you

Thin gage metal welder provides wire speeds up to 1170 ipm

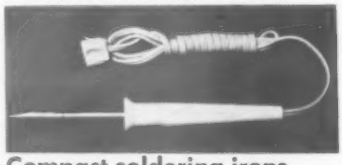
SA-200 Mig welding system for thin-gage materials provides wire speed up to 1170 imp. Welding package includes a 200-amp silicon diode rectifier power source, a compact wire drive system with wide feed range and a new type of straight-through torch. Drive system has range of 90 to 424 ipm with standard gearing. Torch weighs 22 oz and will accommodate wire sizes in mild or stainless steel from 0.25 in. to 0.047 in. Torch is rated 100% duty cycle at 200 amp. A 15-ft. welding cable, gas hose and electric control cable come with torch. **Westinghouse Electric Corp.**

Circle No. 1 on Info-Aid Card.

Spatter-proof compound cuts after-weld clean-up

Water - soluble ready - mixed compound prevents spatter. Applied with brush prior to welding, compound will not burn, smoke or flame and causes no fumes or odor. After welding, spatter wipes clean with dry cloth. Sample supplied on request. **Cleanweld Products Co.**

Circle No. 2 on Info-Aid Card.



Compact soldering irons provide 30, 50 watts

Penline-120 is a small 120-volt soldering iron. Iron has a plastic handle. Units come with 30- and 50-watt integral tip-and-heater assemblies. The 30-watt rating is available with 3/16-in. and 9/32-in. chisel tips. The 50-watt is offered with 3/8-in. chisel tip. Line will be expanded later to include 40-watt tip holder. **General Electric Co.**

Circle No. 3 on Info-Aid Card.

Tungsten carbide rod handles hardfacing

Kenface Arc Rod KT-200 is designed for tungsten carbide hardfacing. Rod is particularly recommended for large pieces on which gas application is not practical. Electric arc rod has solid tungsten carbide core surrounded by a steel sheath. A-c application is recommended, but rod can be applied either a-c or d-c reverse polarity. **Kennametal, Inc.**

Circle No. 4 on Info-Aid Card.

Drill makes ½-in. diameter holes in metal

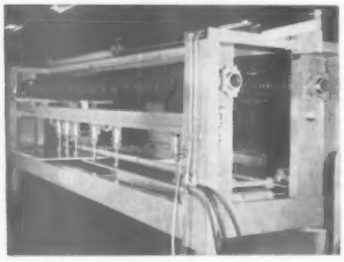
Model 79 drill will drill holes up to ½-in. diameter in metal. Drill weigh 4½ lb. and is 8¼-in. long. Three-amp motor provides 500 rpm at no load and 300 rpm full load. **Skil Corp.**

Circle No. 5 on Info-Aid Card.

Aluminum welding wire made by new process

New process produces extremely clean and perfectly level layer wound aluminum welding wire, according to company. The aluminum welding wire is processed in 1 lb, 10 lb, and 20 lb spools. **American Brazing Alloys Corp.**

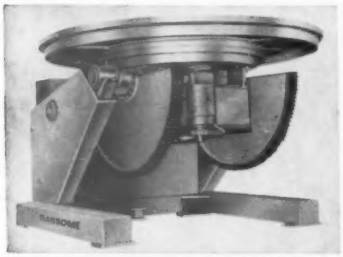
Circle No. 6 on Info-Aid Card.



Machine cuts ferrous, non-ferrous plate

Plate cutting machine cuts both ferrous and non-ferrous metals. Machine will cut aluminum plate 1 in. by 12 ft in less than a minute and 4-in.-aluminum plate at 4 ft or more per minute. For ferrous or steels alloys, cuts are completed at 3 seconds or less psi. Unit control is simple hand-held thumb-operated button. Available with 20-in.-diameter wheel with 15 hp (above) or 26-in.-diameter wheel with 25 hp. **Wallace Supplies Mfg. Co.**

Circle No. 7 on Info-Aid Card.



Positioner rated at 80,000-lb capacity

Positioner is rated 80,000-lb capacity at 20-in. center of gravity. Unit features 36-in. vertical adjustment with no column projection above table top even with table in horizontal position. Reinforced steel table is 12-in. diameter. Top plate is 3-in. thick. **Ransome Co.**

Circle No. 8 on Info-Aid Card.

Welding cable offers high resistance

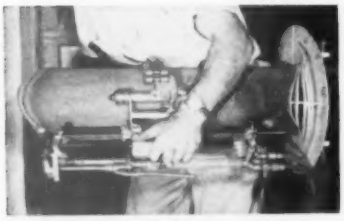
Safety-colored welding cable, Vu-Tron 7, has a better performance index for general abrasion resistance than either chloroprene or synthetic rubber, according to manufacturer. Cable is flame and weather resistant. Bright orange color permits easy identification and helps prevent pilferage. Cable is available in 25-ft. 500-ft and 1,000-ft reels. **Carol Cable Co.**

Circle No. 9 on Info-Aid Card.

Unit rotates 6-in. to 24-in. pipe

Unit rotates 6-in. to 24-in. pipe for manual, semi, or automatic welding and cutting. Adjustable hold-down roll permits joining elbows, ties etc. to straight sections. Idler stands are available for large pipe sections. Lower rolls are rubber covered and driven through machined gear train with variable speed motor. **Cecil C. Peck Co.**

Circle No. 10 on Info-Aid Card.



Device cuts 4-in. to 36-in. pipe

Gale Pipe Cutting Apparatus cuts pipe from 4 in. to 36 in. depending on chain used to hold it in position. Angle of cut can be changed by rotating cutting tip or nozzle. Cut can be made from square to 45 deg. Equipment needs only 5-in. clearance off ground to make circumferential cut. Can be used with any combination or straight cutting torch with adapter. Unit weighing about 15 lb can make saddles 4 in. to 4 in., 6 in. to 6 in. and 8 in. to 8 in. on any center up to 36-in. diameter. **Harris Equipment and Service Co., Inc.**

Circle No. 11 on Info-Aid Card.

STREAMLINED EFFICIENCY

for acetylene cylinders and manifolds

the RUGGED **REGO®** 600 SERIES

"COMPACT" CYLINDER VALVE

YOU'RE NOT PAYING FOR EXCESS WEIGHT

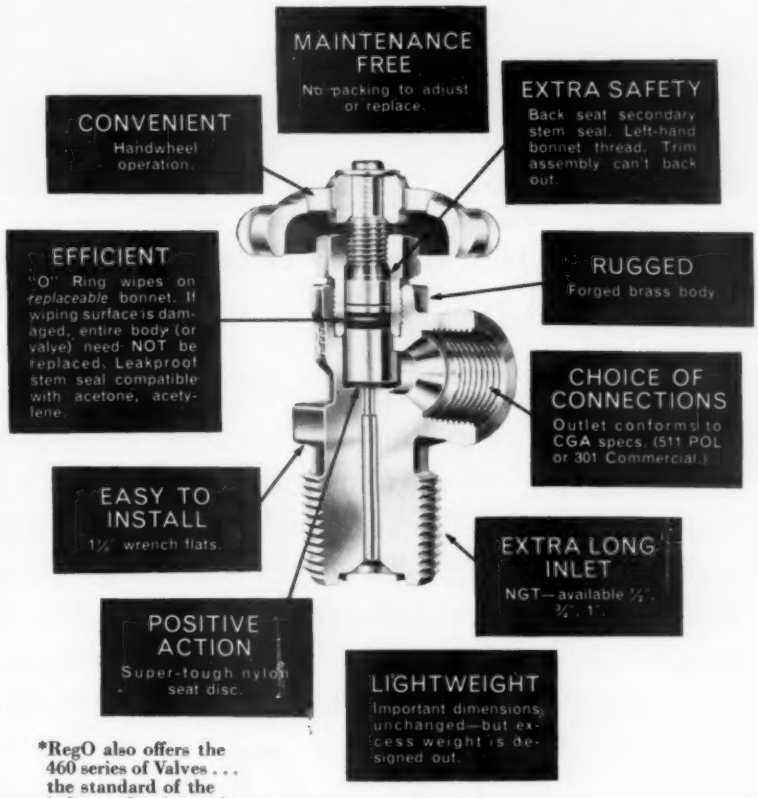
Why pay a premium for more valve than you need? RegO engineers developed the remarkable new compact 600 series "O" ring cylinder valve for maximum efficiency coupled with minimum weight, and cost-cutting economy.

Strength a-plenty is built-in—but without the bulky "fat" that builds-up the price.

THE VALVE WRENCH IS BUILT IN, TOO*

Convenient positive-action handwheel operation does away with bulky, easy-to-misplace valve wrenches. Choice of Umbrella-type handwheel (can't collect water) or standard flat disc-type handle. Adequate clearances prevent "knuckle-busting"; precision machined for smooth one-hand operation.

MORE FOR THE MONEY...TOP TO TIP


MAINTENANCE FREE
No packing to adjust or replace.
EXTRA SAFETY
Back seat secondary stem seal. Left-hand bonnet thread. Trim assembly can't back out.
CONVENIENT
Handwheel operation.
EFFICIENT
"O" Ring wipes on replaceable bonnet. If wiping surface is damaged, entire body (or valve) need NOT be replaced. Leakproof stem seal compatible with acetone, acetylene.
RUGGED
Forged brass body.
CHOICE OF CONNECTIONS
Outlet conforms to CGA specs. (511 POL or 301 Commercial.)
EASY TO INSTALL
1⅛" wrench flats.
EXTRA LONG INLET
NGT—available ⅛", ¼", ½", 1".
POSITIVE ACTION
Super-tough nylon seat disc.
LIGHTWEIGHT
Important dimensions unchanged—but excess weight is designed out.

*RegO also offers the 460 series of Valves . . . the standard of the industry for those who prefer wrench operation.

you'll like the performance . . . and the price
specify: RegO 600 Series cylinder valves and save

free catalog: No. G300-GA **THE BASTIAN-BLESSING COMPANY, RegO DIVISION**
4201 West Peterson Ave., Chicago 46, Ill., Dept. 28-J

For more facts Circle No. 164 on Welding Info-Aid Card

ARCOS STAINLESS OVERLAY CUTS COST

Job Report Courtesy of Pottstown Metal Products Works
Cochrane Div. of Crane Co., Pottstown, Pa.

Arcos stainless overlay cuts overall cost of chemical reactor 10%. The application of a stainless overlay to the face of a carbon steel flange, not available in clad material and too expensive in solid stainless, resulted in a 10% overall saving in the construction costs of an unusual epoxy resin reactor. The overlay was applied by automatic submerged arc, using Arcos Type 308 bare wire and Arcosite C7 flux. This is another example of the economy and performance you get with Arcos stainless filler metal products.

ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

Short arc Mig package includes all equipment

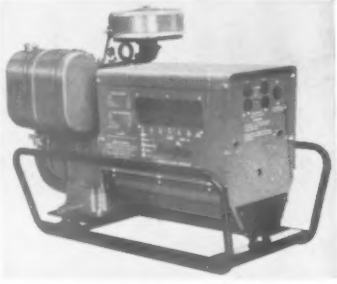
Sigma SWM-14 short arc Mig outfit is lowest cost on the market, according to manufacturer. Outfit includes: wire-feed control unit with centrifugal governor, 200-amp power supply with variable voltage and inductance controls, 14-oz 200-amp torch, shielding gas regulator-flowmeter, 12-in. wire-spool mount, torch service lines and 12½ ft of argon hose and control cable. The 40-lb control unit and other parts can be purchased separately. **Linde Co.**

Circle No. 12 on Info-Aid Card.

Inhibitor guards welds from rust, corrosion

Deoxaluminate protects high tensile and stainless steels from corrosion from the time weld joints are prepared until they are actually welded. Deoxidizing action minimizes the possibility of any pores in the weld due to corrosion products. **Special Products Corp.**

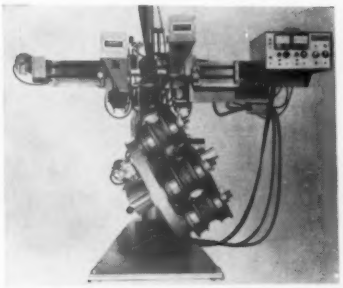
Circle No. 13 on Info-Aid Card.



Compact 180-amp welder is gas-driven unit

Memco Bantam is smaller version of AEA-200-L gas-engine-driven welder/power plant. Unit's 12.3 hp single-cylinder Kohler air-cooled engine drives rotating field generator to produce 180-amp a-c power in 100% duty cycle. It also produces 3.5 kw of 115-volt 60-cycle single-phase power or 1 kw of 115-volt d-c power while welding. **Miller Electric Mfg. Co.**

Circle No. 14 on Info-Aid Card.



Rebuilder is multiple-spindle roller-idler unit

Model MR is multi-spindle roller-idler rebuilding unit with offset main spindle support arm providing minimum head adjustment from tread to flange. Features include columnized electronic control panel, full welding heads, wire straighteners, maintenance-free flux valves and shutoff mechanisms. Carriage assembly is engaged for directional travel by simple 3-position lever. Can be used with layer wound coils or 500-lb packs. System includes two 500-amp constant voltage 100% duty cycle power sources. **Stoody Co.**

Circle No. 15 on Info-Aid Card.

LP-gas salamander has high capacity

At 100 psi, No. 1412 LP-gas salamander has a rated hourly capacity of 150,000 btu per hour. No pressure regulation is required because unit is connected to fuel tank with high pressure. Floor-type unit burns with clear blue flame, without smoke, soot or monoxide fumes. **Insto-Gas Corp.**

Circle No. 16 on Info-Aid Card.

750-amp Mig welder has 5 voltage ranges

Constant potential 750-amp Mig welder features 5 voltage ranges with fine adjustment in each range. Unit includes voltmeter and ammeter, a 2-kva 115-volt a-c power supply with power receptacles for wire feed equipment or travel carriages and a contactor control receptacle. A 1,000 amp version for automatic Mig work is also available. **Miller Electric Mfg. Co.**

Circle No. 17 on Info-Aid Card.

BETTER WELDING THROUGH ARCOS QUALITY CONTROL

X-ray Emission Spectrograph shows analysis of Arcos weld metal

Predictable performance of Arcos weld metal results from strict adherence to uncompromising standards. The program of rigid quality control of filler metal products enforced by Arcos is comprehensive and far-reaching. Every phase in production is subjected to constant inspection. Modern testing instruments provide highly accurate analysis of materials and weld metals. Rigid quality control assures predictable performance of Arcos filler metal products.

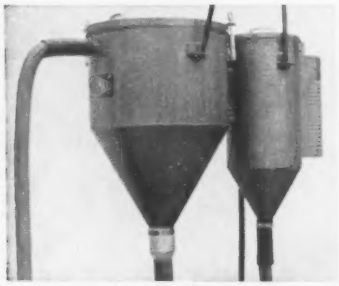
ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

Check valves stop backflow of gases

Reverse flow check valves stop gas backflow. Valves fit all torches, line regulators and cylinder regulators. They stop contamination of oxygen regulators by fuel gas and prevent oxygen from entering gas regulator. Torch models prevent gases from mixing in hoses. Valves operate with all commercial gases. **The Harris Calorific Co.**

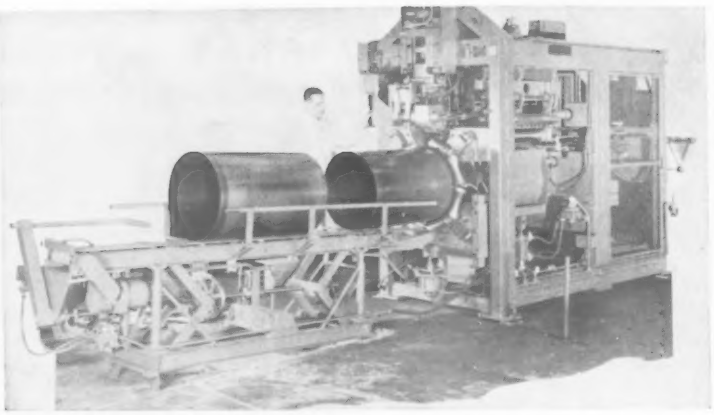
Circle No. 18 on Info-Aid Card.



Unit recovers flux in submerged arc welding

Vac-U-Max flux recovery unit for submerged arc welding operations includes a 1-cu-ft hopper feeder with a ¼-in. mesh screen. Flux passes through screen and larger fused particles are removed. A smaller hopper contains a dust filter to keep material from passing into venturi. Air-operated unit has suction inlet hose with gulper nozzle which is mounted behind electrode to continuously recover flux. **Vac-U-Max.**

Circle No. 19 on Info-Aid Card.



Glass cloth is suited for welding curtain

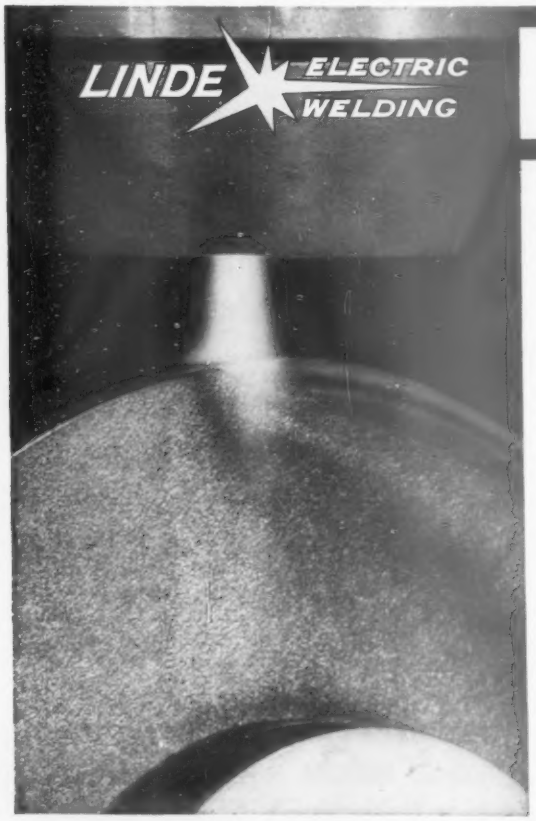
Vinyl-coated glass cloth is suitable for high-temperature applications including welding curtains. Coverlight-V comes in 36-in. and 50-in. widths and in weights from 5 to 20 oz. Available in white and range of different colors. **Reeves Bros., Inc.**

Circle No. 20 on Info-Aid Card.

Machine side seam welds steel container shells

Automatic welder forms and side seam welds steel container shells of large drum sizes. Machine forms flat sheet steel stock into cylinder and automatically positions it at welding station which welds side seam and ejects cylinder. It can be used with automatic sheet feeder or manually fed. Unit handles cylinders 13½-in to 24-in. diameter in 14-in. to 40-in. lengths. It will take 22-gage to 16-gage sheet steel at 20 to 60 fpm and can produce 55 gallon drums at 700 per hr. **The Federal-Warco Div.**

Circle No. 21 on Info-Aid Card.



PLASMARC

NEW...HIGH-SPEED FUSION OF VERY-THIN DEPOSITS WITH CONTROLLED DILUTION

From LINDE, the inventor of plasma arc processes, comes PLASMARC weld surfacing – the first process for depositing very-thin fused overlays of heat-, wear- and corrosion-resistant materials, with controlled dilution, at high speeds. PLASMARC weld surfacing utilizes the intense heat (30,000° F.) of a constricted plasma arc created within its torch and transferred to the work. The metal is fed into the torch as a powder. It is carried to the work in the plasma jet formed from argon gas. *Check these features:*

- Penetration into base precisely controlled to .005-in. and up.
- Dilution with base precisely controlled to 5% up to 50%.
- Deposits as thin as .010-in., as thick as 3/16-in., in one pass.
- Deposits as narrow as 1/8-in., as wide as 1 in. or more.
- Speeds over 20 ipm at 95% deposition efficiency.
- Flatter, smoother deposits than other fusion processes.
- Wide choice of metal and alloy powders for surfacing.

SEE IT "LIVE" AT THE METAL SHOW
Cobo Hall, Detroit, Booth 127, October 23-27

LINDE COMPANY
Division of Union Carbide Corporation
270 Park Avenue, New York 17, New York

UNION CARBIDE

Inert gas enclosure suited for welding

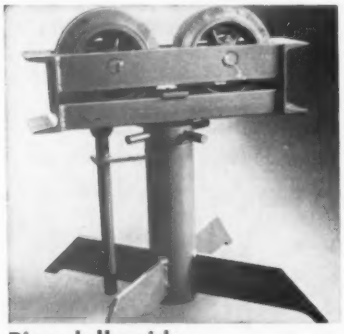
Inert gas enclosure is designed for welding rare metals—molybdenum, tantalum, columbium and zirconium. Selective inert gas can be used with this system. Heavy-steel Eringard is equipped with four 8-in.-diameter glove ports that permit two operators to work simultaneously. Unit has 5-CFM mechanical pump which produces 1-micron base pressure. **Royal Research Corp.**

Circle No. 22 on Info-Aid Card.

Brazing flux designed for cast iron welding

Non-toxic Braz-cast No. 4 is designed for use in welding or repairing cast iron. Melting point of flux is 220 F and it is efficient to 1,600 F. Casting is first prepared for brazing by grinding or burning a vee in the fracture with excessive oxygen flame. End of rod is then heated, dipped in flux. Wiping action in vee is used to wash clean parts to be brazed and bronze rod is applied when tinning action is obtained. **Anti Borax Compound Co.**

Circle No. 23 on Info-Aid Card.



Pipe dolly aids welding positioners

APD adjustable pipe dolly can be used as an outboard support for small welding positioners used to rotate elongated cylindrical vessels and pipe. Dolly will support 3,000 lb on 6-in-diameter rubber-tired wheels. Wheels are on anti-friction bearings. Fixed center-distance setting encompasses 2-in. to 2-ft. diameters. Diameter is unlimited when dolly is used as outboard support. **Aronson Machine Co., Inc.**

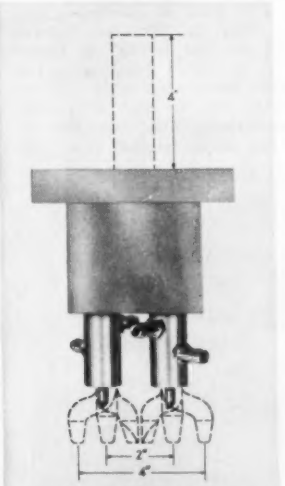
Circle No. 24 on Info-Aid Card.

THE TRADEMARKS TO TRUST

AIRCO

Reduce Welding Time up to 50%

Double-Barrelled Tip Holder Makes Two Equal-Pressure Welds



Absolute fidelity of spacing between welds, in a range from 0 to 4", is accomplished by using Tuffaloy bent offset tips as diagramed above.

The TUFFALOY Equa-Press* Dual Holder makes two spot welds at once, and makes them precisely alike. Upon contacting the work piece, the forging pressure is automatically equalized between the two electrodes, regardless of minor variations in work thickness or electrode wear (up to 3/16").

The two tip-holding barrels are sliding pistons, whose movements are controlled by a mechanical equalizing device sealed in the housing. Maximum conductivity is maintained through the copper-alloy working parts, and water coolant fittings are provided.

Models are made for mounting in a welder arm (above) or for bolting to a press welder platen (left).

Doc Tuffy says . . . you'll almost double your output of closely-spaced welds without adding a man, with the TUFFALOY Equa-Press Dual Holder!

There is an AIRCO or TUFFALOY distributor near you. Call him and ask to see the Equa-Press Dual Holder. Ask him too for the TUFFALOY Catalog . . . it makes correct resistance welding electrode specifications easy.

*Airco trademark

Write today for independent laboratory test results on this new holder.

AIRCO

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated

150 East 42nd Street, New York 17, N. Y.

More than 700 Authorized Airco Distributors Coast to Coast

On the west coast: Air Reduction Pacific Company, **Internationally:** Airco Company International, **In Canada:** Air Reduction Canada Limited

ALL ARE DIVISIONS OR SUBSIDIARIES OF AIR REDUCTION COMPANY, INC.

No other tool saves so much time . . .

Arcair process cuts special cutting time 50%

The Gaston County Dyeing Machine Co., Stanley, N. C., needed a method for speeding special cuts made on stainless steel pressure dyeing and drying vessels and plant machinery.

Metal saws took too much setup time and cutting with regular electrodes required extensive grinding to produce good quality finishing.

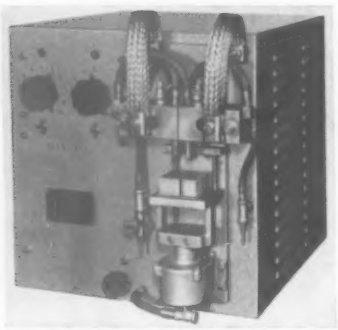
Arcair torches have solved the problem. Special cutting time has been cut by fifty percent.

No matter what metal you work with, Arcair can save you time and money. Call your local Arcair dealer or write for further information. Arcair Company, Dept. 27, Box 406, Lancaster, Ohio.

Arcair®

A10

Circle No. 167 on Welding Info-Aid Card



Welding power pack suited for automatic feed

Model 60-T power pack for multiple spot welding is suited for automatic feed units. Designed for high-production output of small weldments, unit offers single-cycle operation of one or more spots in rapid sequence. Air-actuated timing controls have 100-amp contactors. Power supply required is 220-250 volts 60 cycle, single phase. **Ampower Products.**

Circle No. 25 on Info-Aid Card.

Spooled copper alloys made for Mig welding

Two new copper alloys in spool form are available for Mig welding. Layer-level wound and precision-cleaned silicon bronze and phosphur bronze (grade C) are available in fine wire diameters of 0.035 in., 0.045 in., 1/16 in. and 3/32 in. Phosphur bronze joins, repairs and builds up bronze alloys having similar composition and overlays on ferrous alloys. It will also join ductile iron to high alloy steel. **All-State Welding Alloys Co. Inc.**

Circle No. 26 on Info-Aid Card.

Automatic welder makes transistor components

Automatic resistance welding system welds TO-5 or TO-18 transistor components and unloads assemblies from 17 to 23 per minute. Integrated and sequenced system includes a 30-kva two-column welder, an 8-station indexing table and two stacked vibratory feeding mechanisms. **Thomson Electric Welder Co.**

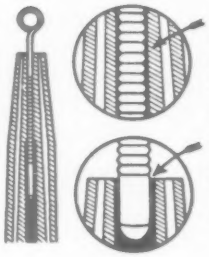
Circle No. 27 on Info-Aid Card.

Let Your Local Welding Supply Dealer Explain Why "YOU GET SO MUCH MORE" *With . . .*

WYPO
Wipes and Polishes
the World's Finest
CUTTING & WELDING TIP CLEANERS

FREE! NEW, SPECIALLY DESIGNED WYPO POLISHING FILE INCLUDED IN EACH SET

More Exclusive WYPO Features



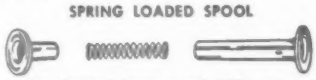
These rounded outer edges of cleaning ridges clean and polish tip orifice without scratching or cutting.

This smooth pilot guides WYPO Tip Cleaner into tip. Will not enlarge or damage tip port.

This cross section view of WYPO Cleaning Surfaces shows these exclusive features: Rounded cleaning surfaces that won't jam or cut.

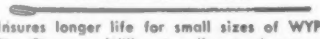
Straight sided valleys insure thorough cleaning by removing all waste.

SPRING LOADED SPOOL



Spring loaded brass spool. Will not rust. Holds cleaners securely in case.

DOUBLE WOUND EYES



Insures longer life for small sizes of WYPO Tip Cleaners. Will not pull out of case.

STAINLESS STEEL POLISHING FILE

Specially designed WYPO File furnished free in each set

NOW AVAILABLE IN 3 CONVENIENT SETS

WYPO TIP CLEANERS
STANDARD SET

CLEANER NO.	FOR DRILL
7	75-74
8	73-71-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49

S S WYPO FILE MADE IN U S A PAT NOS 2429581 2473750 IN CANADA 1948

STANDARD SET OF (12) Cleans (27) Drill Sizes Nos. 75 to 49 Incl.

WYPO TIP CLEANERS
JUMBO SET

CLEANER NO.	FOR DRILL
28	48-47
30	46-45
32	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
45	30

S S WYPO FILE MADE IN U S A PAT NOS 2429581 2473750 IN CANADA 1948

JUMBO SET OF (9) Cleans (19) Drill Sizes Nos. 48 to 30 Incl.

MASTER SET
WYPO TIP CLEANERS

CLEANER NO	FOR DRILL
7	75-74
8	73-71-71
10	70-69-68
12	67-66-65
14	64-63-62
15	61-60
16	59-58
17	57
18	56
22	55-54
24	53-52
26	51-50-49
28	48-47
30	46-45
32	44-43
34	42-41
37	40-39-38
39	37-36
42	35-34-33
44	32-31
45	30

S S WYPO FILE MADE IN U S A

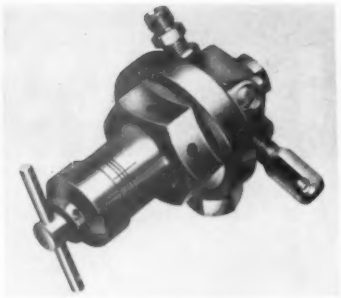
MASTER SET OF (21) Cleans (46) Drill Sizes Nos. 75 to 30 Incl.

Replacement cleaners and files available. Cleaning Range— Cleaner No. & Drill Nos. stamped on back of each case. WYPO GIVES YOU MORE!

SOLD BY LEADING WELDING SUPPLY DEALERS

MAITLEN AND BENSON, INC.
1395 Obispo St., Long Beach 4, Calif.

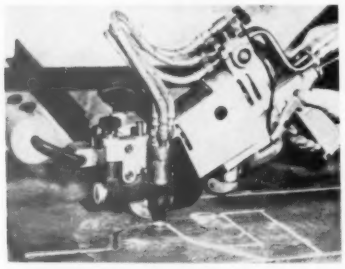
Circle No. 168 on Welding Info-Aid Card



Gageless regulator is all-purpose unit

All-metal gageless regulator for use with most pressurized liquids and gases comes in single stage and double stage models. Rugged regulators are solid forged brass and have individually-calibrated adjustment scales clearly etched on the bonnet for easy reading. Tank pressure is shown by indicator rod which slides inside hex plug. **Dockson Corp.**

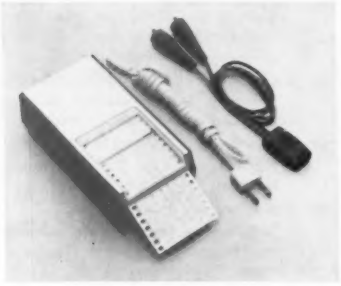
Circle No. 28 on Info-Aid Card.



19-lb flame-cutter cuts 2-in. thick metal

CM-75 Cadet 19-lb flame-cutter cuts metal from light gage to 2-in. thick. Machine is equipped with a clutch giving free-wheeling control for hand-guided contour cutting. Portable unit operates at speeds to 30 ipm and can be used with acetylene, propane or natural gas. **Linde Co.**

Circle No. 29 on Info-Aid Card.



Recording voltmeter is miniaturized unit

Miniaturized recording voltmeter makes a permanent record on moving 2½-in. by 35-ft paper tape. Unit features simplified paper loading, expanded scale. Recorder is 3 1/16 in. by 5 5/8 in. by 1 11/16 in. and weighs 20 oz. **Amprobe Instrument Corp.**

Circle No. 30 on Info-Aid Card.

for BRAZING **for OVERLAYING**

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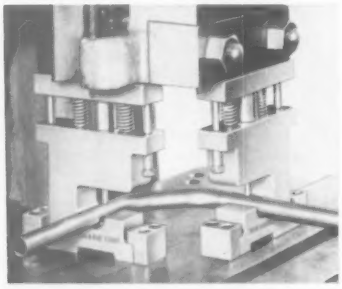
Fluorescent detector finds cracks, leaks

Fluorescent detector finds surface cracks, flaws, defects and porosity in metallic or non-metallic solids. Portable system uses water soluble materials that are easily and completely removed with water rinse or bath. Penetrant uses black light to activate fluorescent materials. **U. S. Casting Repair Corp.**

Circle No. 31 on Info-Aid Card.



Piercing units are self contained

Perf-Arc self-contained piercing units pierce holes in straight or curved tubing. They also pierce flat stock, angle iron and other shapes. Units can be used singly or in gangs of two or more. Units come in various sizes for mounting in die sets, for mounting on sub plate or directly to bolster plate, or for use as self-contained units. **Vogel Tool & Die Corp.**

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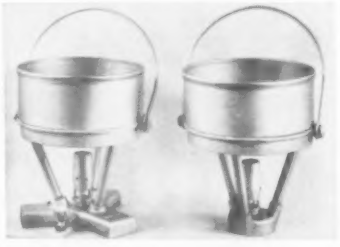

Plumbers furnace melts variety of materials

LP-gas plumbers furnace is available in both a tank top and floor model. It can be used for melting lead, asphalt, tar,, babbit, etc. Furnace will handle up to a 9-in. pot and will operate on full tank pressure or with a regulator. **Wemco Products**

Circle No. 33 on Info-Aid Card.

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Mid-States Power-Tran

180 Amp. Welder
Farm Shop Equipment

★ **Wide Range**
15-180 Amps in 15 steps. Will weld light and heavy gauge materials. 1/16" thru 3/16" rod.

★ **Full 80 Volt Open Circuit Voltage**
Means you can weld with all types of rods — stainless, cast iron, hard surfacing, low hydrogen.

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Proves high quality of components. Your assurance of the best welder available!

★ **Volt-Arc Balancing Net Work**
Voltage automatically adjusts for light gauge materials and gives dense, deep penetration on heavy metals.

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Simplifies current settings — accurate and positive values each time.

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Highly mobile — Use it anywhere in the shop or barn.

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Transformer designed for connection cooling — No fans that require oiling — no maintenance.

★ **Extra Bonus**
Built in "EYE APPEAL." Modern, attractive and follows the same design as the famous MAGNA-TRAN.

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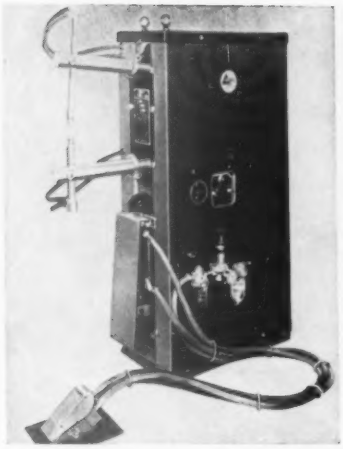

30 kva spot welder has electronic timer

This 30-kva spot welder comes with electronic timer and four heat stages. After preliminary setting, it will produce continuity of welds even when operated by untrained personnel. Solid 2-in. diameter 24-in. copper arms are retractable giving 18-in. throat reach with 12 in. between arms. On air-operated model, arms give up to 24-in. reach. Welder is 380/440-volt 60-cycle unit, gives up to 500-lb pressure at tips. **Triangle Products Ltd.**

Circle No. 34 on Info-Aid Card.

Abrasive cutting machine cuts metal 4-in. square

Model 102-A abrasive cutting machines cut solids up to 4-in. square, pipe and tubing up to 6⅝-in. OD, angle iron up to 6 in. by 6 in., channels up to 8 in., and flat stock up to 6 in. by 1 in. **Allison-Campbell Div.**

Circle No. 35 on Info-Aid Card.

Multi-arc resistors are easily stacked

Series of single-operator welding resistor stations for multi-arc welding systems are in square housings for stacking. Resistor stations permit individual control of current for multi-arc source in 5 or 10-amp steps. Designed primarily for d-c metal arc welding, stations can be used for Tig and other processes. Units are portable and come with a 235 to 310-amp rating or 315 and 400-amp rating. Weights range from 53 to 64 lb, depending on rating. **J. B. Nottingham & Co., Inc.**

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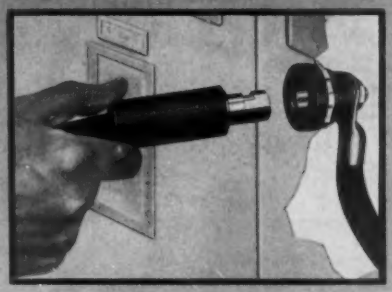
Specify



cam-lok

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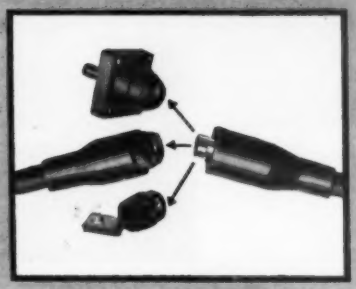
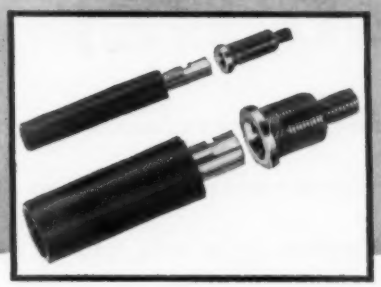
- KSM Prods.
- Mid-States
- Brenweld
- Birdsell Prods.
- Hughes Aircraft Co. (Vacuum Tube Prods. Div.)

. . . . and many others





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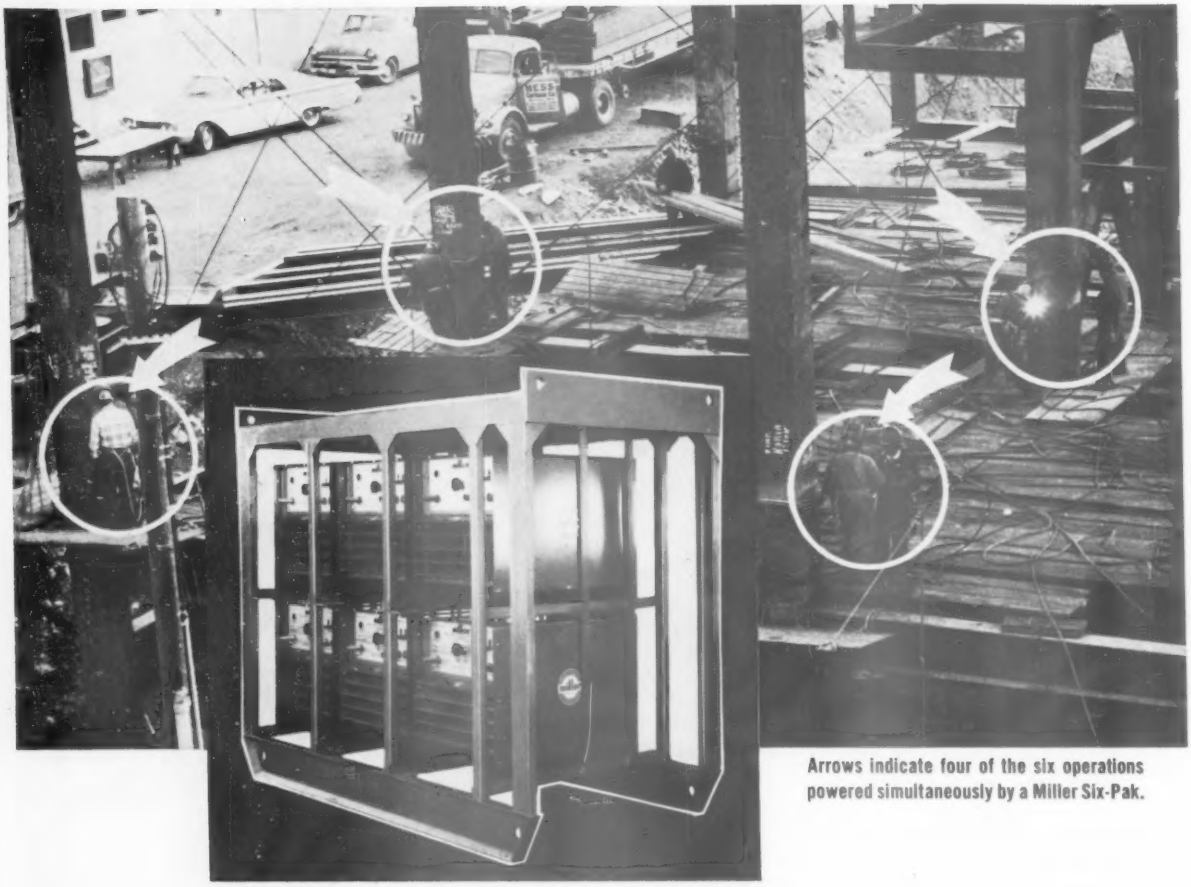

Arrows indicate four of the six operations powered simultaneously by a Miller Six-Pak.

YOU GET MORE with a miller

And more and more engineers know it. Miller's latest development for the industry is the above Six-Pak comprised of six Gold Star SRH-444 rectifier type d-c welders. Featuring the exclusive Miller rectifier, these weld stations will probably revolutionize parts of the building industry as their speed, versatility and economy open new possibilities never feasible with motor generator set-ups. Frame is built to construction trade standards and there's a choice of 200, 300 or 400 ampere welders in either the Six-Pak as shown or the Three-Pak.

A full and detailed description will be sent upon request. Also available free is a new pamphlet "Rectifiers For Welding."

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Our purpose: to define, describe and promote the use of welding and its allied processes in every production and maintenance activity to all phases of industry and business.

Another race to run

THE RUSSIANS have done it again . . . they have lapped us in the welding race. On two occasions recently, we were shown how they pulled ahead of us in this newest contest.

In 1959 the U.S.S.R. announced its current seven-year plan in which welding was given a great deal of prominence. Now, two years later, a magazine article states welding has come up to all Soviet expectations.

Not only is it saving them millions in rubles, but thousands of tons in materials as well, while providing a more durable line of products.

The second indication of increased Russian acceptance of welding came in the form of a motion picture. It pointed out how they are using the electroslag process advantageously to join extremely thick-walled pressure vessels and other heavy plate structures at tremendous speeds.

For years WELDING ENGINEER has been preaching (seemingly to deaf ears) the practicality of welding. Yet many of our educators continue to teach engineering students how to design pressure vessels of riveted construction. And it is doubtful if any pressure vessels have been so fabricated in the past 25 years.

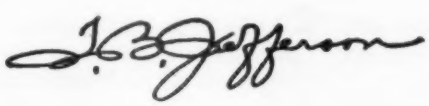
In structurals, our engineers continue to make designs that demand a member punched full of holes and the holes filled with bolts or rivets.

Why this reluctance by engineers to adopt welding as a means of fabrication until the particular job becomes too complicated for the accepted joining methods?

Welding is designed to do the difficult jobs; the evidence of its usefulness in these areas can be seen at every turn. Welding is not looking for easy jobs just to be able to say the products are welded.

In most cases, however, any job can be done better by welding. Generally, this modern joining process affords the means of saving material, reducing production time and weight, improving appearance and often lowering costs.

The race has already started. Are we going to be lapped again?



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...another welding helmet first!

4½" x 5¼"

WIDE VISION

120% Increased Vision!

22 ozs.

LIGHT WEIGHT

Including Lens...as light as helmets using small lens!

$10.10*

LOW COST

Complete with Lens...costs no more than standard helmets!

**Depending on quantity. Canadian prices slightly higher.*

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Safety... Comfort... Economy!

1. Heat- and moisture-resistant Lightweight Fiberglas-reinforced shell, Gray color.

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3-C Headgear

3. Wide Range Adjustable Type "C" Friction Joints.

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Ask Your Welding & Safety Distributor!

Courtesy Alloy Rods Co., York, Pa.

WELDING FUMES . . . SIMPLE PRECAUTIONS WILL PROTECT YOU FROM THEM

THE AREA through which you breathe (that is, the air sacs in your lungs), totals more than 1,000 sq ft.

And since your lungs are the organs through which oxygen enters the blood stream, it is logical that they should be protected as much as possible during welding operations.

Note that we do not say "protected completely." Complete protection of the lungs, like that of the eyes (*see page* 39) and the hands (*see page* 42), is not only unnecessary, but also impossible.

Your lungs can tolerate varying amounts of gases, fumes and dust without serious consequences. These same elements, however, can lead to illnesses if certain simple precautions are not observed.

But at no time will welding fumes cause the many sicknesses and diseases which were, and sometimes still are, ascribed to welding (*see box*).

Three injurious gases are produced by the welding arc and/or oxy-gas flame: nitrous gases, ozone and carbon monoxide.

(Another highly toxic gas, phosgene, results when tricholoethylene is decomposed by heat. Therefore, all metal parts must be decontaminated before any welding is begun.)

Generally, continuous exposure to these gases does not occur unless automatic welding setups are being used, and even then the weldor is not engaged in actual equipment operation more than half the time.

The most common nitrogen oxide gases (which all have a sweetish odor) are:

Nitrous oxide — an anesthetic gas which has no particularly irritating affects in the presence of sufficient oxygen.

Nitric oxide — a slightly toxic gas, which in the presence of oxygen coverts into nitrogen dioxide.

Nitrogen dioxide — an unbreathable, highly irritating gas.

This last nitrous gas has been held responsible for vertigo (dizziness), dilation of arteries, severe inflammation of lungs and upper respiratory tract, and even pulmonary edema (weldor's pneumonia).

Maximum concentrations of

nitrogen oxides permissible is about 25 parts per million when exposure is prolonged. A limit of five parts per million has been recommended for nitrogen dioxide.

Tests on an arc welding operation in an open room recovered appreciable amounts of nitric oxide in the arc vicinity, but not in concentrations high enough to be dangerous.

Other tests made on an oxyacetylene welding operation gave such small quantities of nitrous fumes that evidence was not conclusive. Therefore, under ordinary gas welding conditions, these fumes do not occur in sufficient amounts to be a hazard.

It must be emphasized, however, that these tests were made in an open room, and the results do not apply to welding in fixed positions such as welding booths, or in confined areas.

Ozone is produced by almost every electric arc, including short wave-length ultraviolet rays. It is classed as an irritant and although it has no cumulative effects, exposure to high concentrations may cause severe shortness of breath, lung irritations and possibly lung fluid.

A limit of 0.1 part per million has been recommended. However, studies have shown that under usual conditions, with proper ventilation, high concentrations are not encountered.

Carbon monoxide is a dangerous internal asphyxiant which prevents oxygen from being carried by the blood. Maximum allowable concentration for a continuous eight hour exposure is 100 parts per million.

In case of fume poisoning from any of these gases, immediate removal to fresh air is essential. Artificial respiration and oxygen inhalation are recommended for carbon monoxide poisoning, but not for nitrous fume poisoning, unless breathing has stopped.

In general welding, adequate natural or mechanical ventilation should be furnished, while local exhaust and ventilation or individual respiratory equipment should be provided for welding in confined spaces.

In open-air welding or in large, well-ventilated repair shops, hazards from atmospheric contaminants are usually negligible, particularly if welding is done only intermittently.

But when welding is performed on a production basis in inadequately ventilated spaces, the respiratory risks may become serious.

The accumulation of toxic substances in fixed welding operations can be prevented by lateral or down-draft ventilation at the work bench; by use of exhaust fans; or by readily movable hoods located close to the welding operation. Openings at both the top and bottom of the booth will allow free circulation of air.

Besides the gases which normally arise in the fumes from almost every welding arc, there are other fume concentrations, *i.e.*, different metals emit distinct fumes when heated to welding temperatures.

The metals requiring primary consideration are: lead, zinc, brass, bronze, cadmium, beryllium, fluoride, chrome and manganese. With the same ventilating precautions prescribed for arc fumes, these metal fumes can also be reduced to a point of being negligible.

Truth of the matter

Medical authorities have conducted research for years to determine the credibility of literally thousands of health complaints attributed to welding.

With proof to back their contentions, here is what the experts say:

(1) Welding fumes do not cause pneumonia.
(2) Welding fumes will not cause tuburculosis.
(3) Welding fumes do not result in silicosis (a lung disease caused by inhalation of silicate or quartz dust).
(4) Welding fumes have no connection with ulcers.
(5) Electrode coatings do not produce toxic gases.
(6) Lead poisoning is the only chronic ailment that could be caused by welding fumes; other illnesses ascribed to fumes dissipate quickly and have no cumulative effect (see below).
(7) Weldor's siderosis (caused by inhalation of iron particles) is not an occupational hazard. Although detected occasionally in weldors who have worked continuously in their trade for more than six years, it has been pronounced benign in every case.

Metal fume fever (or zinc fume fever) is a 24-hour illness resulting in severe chills, fever up to 103 F, heavy perspiration, respiratory irritation, throat dryness, dry cough, nausea, vomiting and headache.

It is commonly caused by inhalation of zinc oxide particles when welding zinc or zinc-bearing alloys without proper protection. An increase in white corpuscles also occurs to prevent immediate recurrence of the illness. There are no after effects.

And here again, proper ventilation or individual respirators are effective preventives.

How to select proper eye shielding

by **R. E. Little** and **G. H. Schauweker***

THE HUMAN EYE, with its shielded position in the head, its lashes and lids, is the best naturally protected organ in man's body.

At times, however, the additional protection of glasses or shields are necessary, especially in most industrial operations where protection from flying objects is a major consideration.

And when welding or cutting, additional protection from harmful visible and invisible radiation is also essential.

The visible radiation, or light, present in the welding area is potentially harmful because of its intensity or glare, (*i. e.*, a brightness causing discomfort and impairment of vision, such as temporary blurring or eye fatigue).

Invisible radiant energy is divided into ultraviolet and infrared radiation. Figure 1 shows the eye's sensitivity to the radiant energy spectrum. Ultraviolet rays are below the visible spectrum, infrared above it.

Although they cannot be seen, both types of rays are potentially hazardous and can cause permanent eye damage.

The eye can stand some small exposure to ultraviolet rays, but because of its lack of warning and the seriousness of the possible eye damage, the eye must be protected.

Excessive ultraviolet exposure (weldors' flash) results in "sand in the eyes" some four to six hours later. This is a form of conjunctivitis and can cause permanent damage.

Infrared rays do give some warning; heat and an immediate burning sensation. Nevertheless, since the results can be just as harmful, protection from these rays requires equal precaution.

Therefore, the purpose of protective lenses is to exclude the three harmful radiant energies: glare, ultraviolet and infrared rays.

Filter glass does this by selectively absorbing harmful radiant energy while transmitting harmless visible light to the eye.

The perfect filter glass would eliminate ultraviolet and infrared radiation plus any other undesirable rays such as sodium flare. It would also reduce sufficiently the glare from transmitted radiation for the weldor's comfort and yet retain correct relative intensities. This, of course, is impossible.

Generally, any filter glass which completely absorbs both ultraviolet and infrared rays must also absorb much visible light from the blue and red ends of the visible spectrum. Thus, welding filter shades transmit mostly bluish-green or greenish-yellow light, which is satisfactory for most operations.

Relative transmittance of typical filter glasses is shown in figure 2. Each curve shows relative absorption and transmittance characteristics of a particular type of glass.

The curves for the three (all-purpose welding filter glass, sodium-flare reducing glass, high-amperage welding glass) have been adjusted mathematically to make comparison on the same graph possible.

The ability of any glass to screen out the ultraviolet and infrared rays is entirely a function of its chemical composition. However, the color density of a particular glass can be varied to change the degree of glare reduction, while permitting

*Messrs. Little and Schauweker are, respectively, marketing supervisor, National Cylinder Gas Div., and product development manager, American Optical Co.

adjustment to the different sensitivities of individual eyes.

Shade numbers identifying welding filter glass indicate only optical density. The higher the number, the denser the glass, the greater the glare reduction, and the less the visible light transmitted.

The numbers are based on the intensity of visible light transmitted through the glass as established by the National Bureau of Standards. Absorption characteristics of typical welding filter glasses are shown in table 1.

Note that these glasses completely exclude ultraviolet rays and provide virtually complete protection from infrared rays. Only the percentage of visible light transmission is materially affected by increasing the optical density as indicated by the shade numbers.

The absorption-transmission characteristics of these same filter glasses given in table 2 indicate the visible colors which are transmitted through the glass to the eye.

The glare reducing glass has relatively high visible light transmission properties, and hence, is not recommended for cutting or welding.

However, it can be used for soldering and is excellent for those who are occasionally exposed to the glare of arc welding. Note that it effectively screens invisible ultraviolet and infrared rays while providing good visibility.

All-purpose welding glasses usually give a distinct blue-green tint from the visible spectrum and also effectively screen the invisible rays, even in the lightest shade.

Because of the differences between individuals, the exact shade number should be chosen, through trial and error, by the weldor himself. Once he has determined the right shade for his eyes, replacement of the glass can be made without further tests since numbers are well established throughout the industry.

Filter glass	Shade number	%Transmission Visible light	%Absorption Ultraviolet rays	%Absorption Infrared rays
Glare reducing	1.7	53	100	80.0
	2.0	35	100	92.0
	2.5	20	100	95.0
All purpose	8	0.10	100	99.9
	9	0.037	100	99.99
	10	0.014	100	99.99
	11	0.005	100	99.99
	12	0.0019	100	99.99
	13	0.0007	100	99.99
Sodium flare reducing	3	14.0	99	95.0
	4	5.2	100	97.0
	5	1.9	100	99.0
	6	0.72	100	99.0

TABLE 1

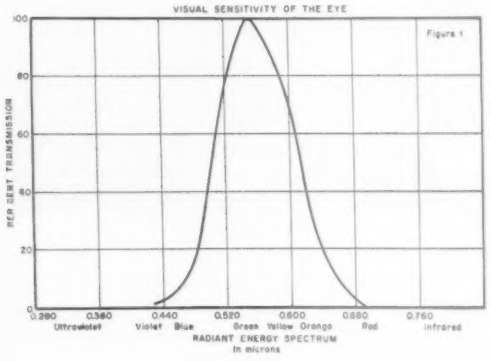


FIG. 1

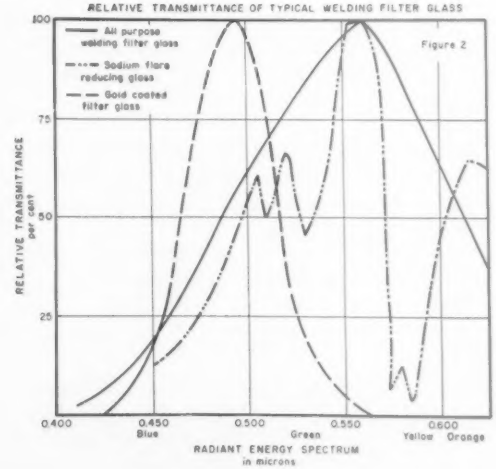


FIG. 2

Certain welding operations (*e. g.*, with some coated electrodes or when welding aluminum or magnesium) produce a high intensity of visible yellow radiation. A special filter glass containing didymium is used to combat this sodium flare.

Besides absorbing infrared and ultraviolet rays and reducing glare, this glass also cuts sodium light transmission to a negligible point. And by removing the bright sodium glow, it permits the weldor to view his work clearly.

When using the special didymium glass, the weldor may be able to use a lighter shade than normal and gain added visibility around the center of operation.

However, the lighter shade will also alter the red and orange values to which he is accustomed and may cause him to overheat the metal until he becomes used to the lighter shade.

Generally, these basic filter glasses are adequate for all welding processes in use today. But in some,

especially the inert-gas shielded ones, the high currents used create a heat problem.

In absorbing high levels of infrared energy developed at high welding amperages, conventional filters become hot, and while they protect the eyes adequately, they re-radiate heat to the weldor.

This is not dangerous, but can cause great discomfort and reduce efficiency. To counteract this heat buildup and re-radiation, a gold coated protective glass filter has been developed, particularly for arc welding where excessive infrared radiation is present.

The thin gold film reflects substantial amounts of radiant energy and thus reduces the amount absorbed by the glass. Yet it affords good visibility in the blue area of the spectrum (see figure 2).

The glass also absorbs the yellow flare associated with certain processes and meets federal specifications for ultraviolet and infrared absorption and visible light transmission.

In tests conducted at a naval shipyard, most weldors using the glass for both metal-arc and inert-gas shielded welding reported considerably reduced eye strain. It is also expected to be useful when plasma cutting.

However, weldors who have always used all-purpose filter glasses may require a few days to adjust to the distinctly blue image they see through the glass.

When selecting a welding filter glass, the type of welding operation and the weldor's own visual sharpness are primary factors. Generally, except for operations producing sodium glow and to reduce heat at high currents, all-purpose filter glass will be used.

The shade number will be determined by the type of welding being done (and in arc welding, the electrode diameter or amperage) and the weldor's own choice.

Shade numbers as recommended by the American Welding Society are shown in table 3. The table should be used as a guide since, as mentioned previously, shade numbers merely indicate variations in the amount of visible light transmitted.

One other important factor is optical quality. Filter glass made to specifications established by the National Bureau of Standards are of the highest quality.

However, lower quality filter glasses, meeting so-called commercial specifications, are available. The differences between the two are in the glass' physical characteristics.

Commercial quality filter lenses and shades will have slight imperfections not occurring in the best quality glass. When protecting such vital organs as the eyes, the best is none too good.

Poor welds caused by an imperfect filter glass could in the long run be far more expensive than the best glass in the first place.

Quality of the protective equipment in which the filter glass is used must also be considered. If the weldor's hood leaks light, it is nullifying the glass' protective qualities.

Hoods of reflective materials designed to reduce transmitted heat are becoming very popular. In addition, hoods and goggles should be comfortable and easily adjusted, and should afford complete protection from spatter, chips and other flying objects.

(*For a reprint of this article, circle number* 249 *on the Welding Info-Aid Card, page* 97).

Light or ray	Glare reducing	All purpose	Sodium flare reducing
Ultraviolet	A	A	A
Violet	T	T	A
Blue	T	T	T
Green	T	T	T
Yellow	T	T	A
Orange	T	T	T
Red	T	T	T
Infrared	A	A	A

A=Absorbed T=Transmitted

TABLE 2

Recommended shades

Operation	Shade number
Soldering	2
Torch brazing	3 or 4
Oxygen Cutting	
up to 1 in.	3 or 4
1 to 6 in.	4 or 5
6 in. and over	5 or 6
Gas welding	
up to 1/8 in.	4 or 5
1/8 to 1/2 in.	5 or 6
1/2 in. and over	6 or 8
Manual metal-arc welding	
1/16, 3/32, 1/8, 5/32 in. electrodes	10
Tig welding (nonferrous)	
Mig welding (nonferrous)	
1/16, 3/32, 1/8, 5/32 in. electrodes	11
Tig welding (ferrous)	
Mig welding (ferrous)	
1/16, 3/32, 1/8, 5/32 in. electrodes	12
Manual metal-arc welding	
3/16, 7/32, 1/4 in. electrodes	12
5/16, 3/8 in. electrodes	14
Atomic hydrogen welding	10 to 14
Carbon-arc welding	14

TABLE 3

by **Robert B. Medvin**
Riegel Textile Corp.

Are you using proper welding gloves?

THE HUMAN HAND suffers 25% of all industrial injuries — at an average cost of $345 for each accident.

Viewed in this light, selection of the proper glove for a particular welding operation assumes a new importance.

With a little understanding of the welding glove's basic features, you will be in a better position to make this selection, and possibly even realize a savings.

The welding glove has one primary purpose: protection against heat, sparks and metal flow. The degree of protection depends on the particular job involved.

Different gloves with special features are designed for specific welding applications. Obviously, a glove worn for resistance welding, where there is comparatively little spark or heat, does not require the same features as a glove used when manual metal-arc welding (high heat, heavy spark) or inert gas-shielded welding (high heat, little spark or metal flow).

Although weldors use many different types of gloves, not all can actually be classified as a true weldor's glove, that is, top quality, heavyweight leather as gloves or mittens, fully welted.

Thick leather is fire-retardant and will not burn from exposure to heat or contact with sparks as easily as other glove materials. Thus, quality and thickness (weight) of the leather are important factors in the glove's degree of heat resistance.

Leather weight units are given in ounces and are equivalent to specific measures: one ounce leather is 1/64-in. thick, two ounce leather is 2/64-in. thick, etc.

Leather quality is determined by the area of the animal from which it came. Glove manufacturers usually refer to side and shoulder splits: side split is the hide portion covering the ribs; a shoulder split comes from the animal's shoulder and neck.

The side split is usually more uniform and more flexible, has fewer imperfections, such as scars and open or weak fibers. The shoulder split tends to be more course, less uniform, less flexible.

In welding gloves, cowhide and horsehide are used almost exclusively. Cowhide is good, but horsehide is better, since it is softer, more comfortable and provides even greater resistance to heat.

[*Ed. Note: A special survey on leather and glove prices was conducted recently by* WELDING ENGINEER'S *Research Dept. Half of the glove manufacturers queried stated cowhide was the most difficult leather to obtain, with horsehide and carpincho close behind in that order. Main reason: shoe manufacturers turning to glove leathers, and paying a much higher price to get it. There was general disagreement on whether leather imports (deer skin, goat skin, carpincho, cowhide) were increasing or decreasing, and they split 50-50 on the question of these imported hides being less costly.*]

Still another factor in heat resistance is glove size. Since air is a natural insulator, an extra roomy glove provides additional air-space resulting in additional insulation.

But a combination of air and leather alone does not offer enough resistance on those heavy welding jobs where heat is intense. Thus, an insulated lining is added to the back of the hand and cuff area where extra heat protection is most needed. A variety of linings are in use, but wool content materials are most economical and effective.

In addition, some gloves are especially tanned for welding ap-

plications to provide even greater heat and shrinkage protection. The special tanning is usually distinguished by a distinctive green color. All green leathers, however, are not specially tanned, so color alone is not a reliable guide.

The final consideration in glove selection is the design. A gunn-cut glove has a seam where the middle two fingers meet the palm. A clute-cut eliminates this seam and is generally more comfortable.

Every individual will have his own ideas on which glove he wants to use. But generally, depending on the type of welding being done, weldors agree on certain designs.

For example, in a shop where many maintenance weldors are doing general work (including fit-up and handling of steel) a clute-cut buff-horsehide glove is usually preferred. This type of glove is flexible, has feel, and enables the weldor to handle tools other than those for welding.

Pipe weldors want feel in their gloves, too, but they also want the gloves to be suitable for tough service. Hence, pipe weldors select gloves similar to those used for maintenance welding.

On production work where heavy welding is the order, the preferred glove is heavy cowhide with patches on the back for extra protection and a double lining. Such gloves generally require other reinforcements such as patches and double leather on the thumbs.

This same heavy glove will be preferred on piecework welding, particularly where the weldor or his helper must put weldments into a jig and take them out again and again. This handling of weldments means the glove must have extra heat protection in the palm and must also be able to withstand the abrasive action encountered.

Regardless of design, glove construction is important. A true welding glove should be fully welted. (A welt is a piece of leather sewn in between the seams.) The welting crushes down between the fabrics seamed together, protects the seams from sparks, and prevents the seams from burning, opening and thereby exposing the weldor's hand to other sparks.

Welting is especially important in the danger area where the thumb seam meets the closing seam. Other important areas are over the index finger to the top of the glove, the base of the fingers and the entire thumb and cuff seams.

When checking the seams, also note the glove back. A one-piece, seamless back construction eliminates seams in this danger zone most exposed to sparks and metal flow. Gloves for heavy welding applications should have this seamless construction.

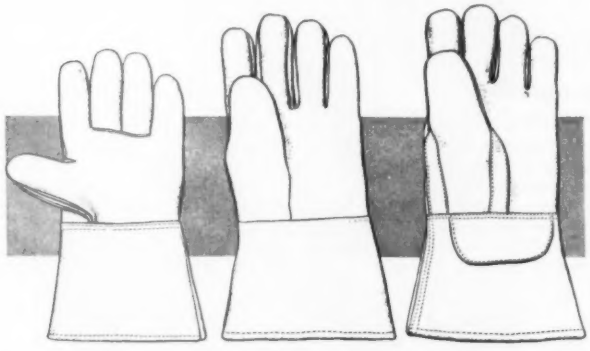
Where sparks and metal flow are light, such as in spot welding, a two-piece, seamed construction is adequate and less expensive.

Mittens give even greater protection by eliminating finger seams and reducing the number of vulnerable danger areas. However, mittens reduce finger dexterity and should be used only on jobs where movement is not essential but where maximum protection is required.

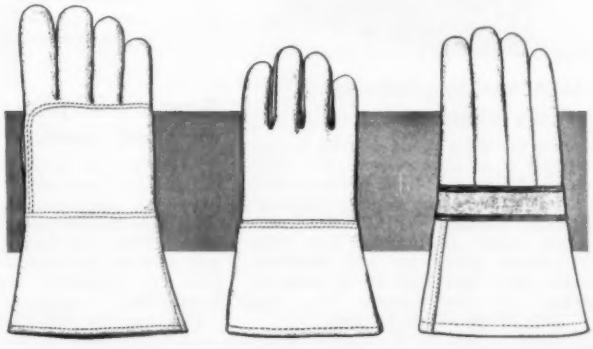
Each glove should offer complete protection against the dangers of a particular job.

This is the single, most important consideration when selecting your welding gloves.

(*For a reprint of this article, circle number* 250 *on the Welding Info-Aid Card, page* 97.)



LEFT — Middle two fingers are sewn into gunn-cut. CENTER—A single piece of leather is used for palm and fingers in clute-cut glove. Here thumb is inset. RIGHT — Clute-cut glove is designed for hard and rough service, has reinforced inset thumb.



LEFT — Back patch provides extra protection, especially for overhead welding. CENTER — one piece back eliminates seams in this danger zone most exposed to sparks and metal flow. RIGHT — For certain glove backs, many pieces of leather are sometimes sewn together.

Special Safety New Products

Flip-up visor prevents injuries to the eyes

Flip-Up Visor to safeguard against eye injuries is easily attached with snap clips to any hard hat or cap. Plastic visor is 0.030 acetate bound on edges. Visor comes in clear or green and is adjustable. It can be swung up under hat brim when not required. **Davis Emergency Equipment Co.**

Circle No. No. 47 on Info-Aid Card

Light welding helmet offers wide vision

No. 880 Wide-Vision welding helmet weighs 22 oz complete with lens. Lens size is 4½ in. by 5¼ in. for maximum vision. Helmet has plastic headgear, ratchet headsize adjustment, overhead depth adjustment, free float suspension joint arms and all-aluminum parts. **The Fibre-Metal Products Co.**

Circle No. 48 on Info-Aid Card.

Forced air heater cuts carbon monoxide

Directflow forced air space heaters are designed for buildings where frequent air changes are necessary. Gas-fired unit controls noxious gases, acid fumes, dust or hot vapors. Unit handles only non-recirculating make-up air and has no combustion chamber. Combustion takes place in air stream. Carbon monoxide in air flow is reduced to nil. **Dravo Corp.**

Circle No. 49 on Info-Aid Card.

CO_2 fire extinguisher is hand-portable

Carbon dioxide hand-portable fire extinguisher comes in five models. Ratings by the Underwriters Laboratories, Inc., based on test fires in open containers using gasoline as fuel, are 4BC, 8BC, 10BC, 12BC, and 12BC (CQ) for the models with 5, 10, 12, 15 and 20 lb of CO_2 respectively. Units weigh 16, 34, 36, 42 and 57 lb, respectively. Actual UL tests are for areas 2½ times the ratings given. Units are designed for handling by untrained personnel. **Cardox Div.**

Circle No. 50 on Info-Aid Card.

Groove-joint pliers are spark resistant

Groove-joint spark-resistant pliers can now be obtained in four sizes. A 16-in.-long 4-in.-capacity and 6½-in.-long 1-in.-capacity model have been added. Pliers are forged from alloys approved for non-sparking use in a Dept. of Commerce report. **Ampco Metal, Inc.**

Circle No. 51 on Info-Aid Card.

3 welding hand shields are made of fiber glass

Three fiber glass hand shields are recommended for inspecting welding operations. One shield is curved-chin style and dark grey. The second is narrow shell-style with flanges on sides, top and bottom. Third is straight bib style. All three have aluminum glass holder and straight handle of formed fiber. **American Optical Co.**

Circle No. 52 on Info-Aid Card.

Aluminum coating adds heat resistance

Alumination can be used to impregnate materials with aluminum to add heat resistance to 2,500 F. Textile, leather, paper, plastic or fabric retains texture and pliability after treatment. Process can be used on variety of gloves and safety apparel. **Thermo-Chem Corp.**

Circle No. 53 on Info-Aid Card.

Protective unit guards health of weldor

Whitecap model WL-1 provides complete above-the-shoulder health protection for the weldor. System guards head, eyes, nose, throat, face, neck and entire respiratory system. Air is supplied to weldor through a centrifugal filter/blower or a special hose adapter connecting the system to in-plant compressed air. **Jamieson Laboratories.**

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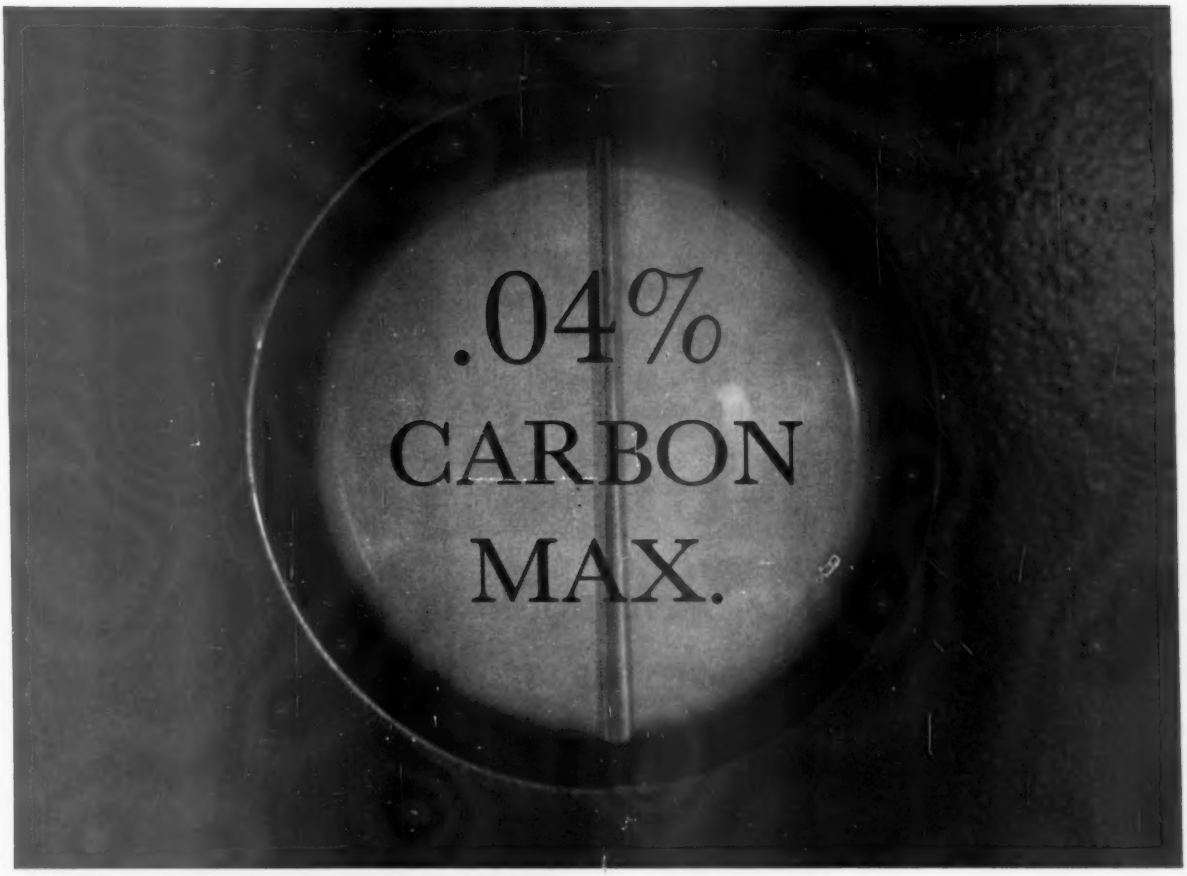

Carbon content is critical to the success of the stainless steel fabricator and super critical where the extra low carbon grades of electrodes are involved.

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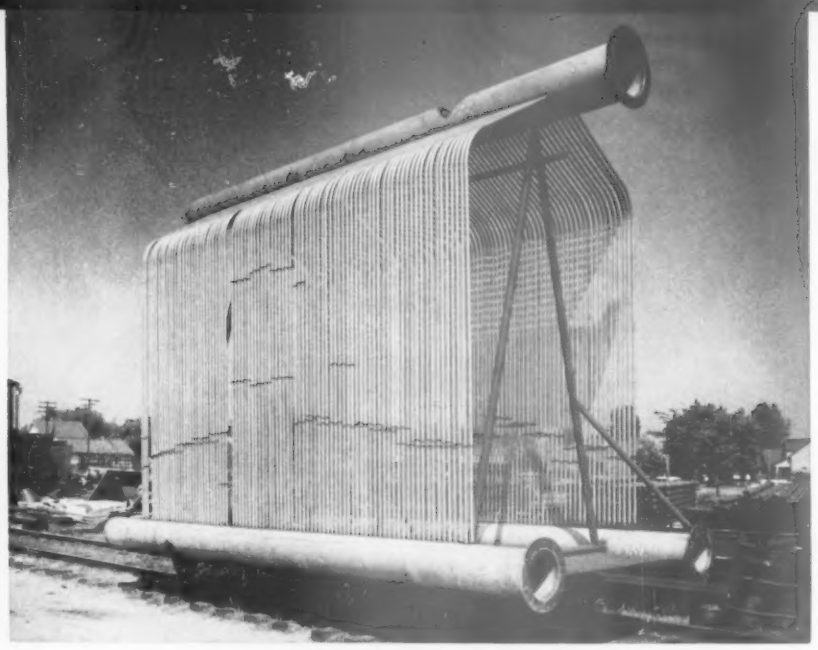

TYPE 347 stainless tube bundle for gas-fired furnace. Hydrogen gas will pass through tubes and be heated to 1,600 F for metal reduction operation. Author asks: "Are code rules too strict for this service?"

A welding engineer defends codes as vital to progress

by **R. H. Hoefler**
Chief Welding Engineer
Kaighin & Hughes, Inc.

MANY ARTICLES recently have been written by recognized individuals on the subjects of codes, quality and welding — primarily to prove that code restrictions on welding are too strict and prevent continued growth of the welding industry.

The distressing fact in all these articles was the liberal use of the term "quality." Some authors pointed out that codes were written to cover "high-quality" welding and were too restrictive for installations that warrant "normal" or "low-quality" weldments.

What is "quality welding?" Webster defines "quality" as a *degree* of excellence, but engineers tend to define quality as the *ultimate* of excellence.

When we discuss quality and code welding, we must consider the proper definition. We must also remember that various limits of quality are required in every industrial installation, as well as between various types of industry. If individual codes were written to cover minimum quality limits of each phase of an industrial installation and each type of industry, continued growth would be practically impossible.

Codes are written to serve as a guide to minimum design fabrication or erection requirements for industry in general. Factors of safety are based on the industrial rate of weldment or material failure.

A recent article concerning codes and quality limits referred to work conducted at Ohio State University. This investigation outlined the effect of porosity on weldment strength and concluded that porosity limits far exceeding those outlined in our major codes would not lower strength below that of base metals being joined.

Although the work described in this paper was complete and offered much useful information, it alone cannot be used as a basis for lowering code limits of quality.

The tests described in this paper were tensile, yield and ductility tests (guided bend) on carbon steel weldments, and were conducted at room temperature. Allowable stress tables outlined in various codes do not limit carbon steel designs to room temperature, but generally begin with a range of —20 F to +100 F. To assure a realistic allowable stress factor for this range, we must consider the porosity effect and other quality factors on carbon steel throughout this range.

Porosity limits described in the Ohio State paper would seriously change the transition temperature and could create a very weak or brittle vessel, pipe or structure under lower or elevated temperature operating conditions.

As an example, we may construct a bridge and tolerate considerable porosity in the weldments provided that the bridge will always be subjected to a temperature range of 55 F to 100 F. Should temperature drop to 20 or 10 F, how can we predict ductility of these porous welds, and how will they respond to the shock loading of changing traffic conditions?

The same question may be asked regarding industrial vessel or piping systems. Why, for instance, do so many improperly made gas line welds fail in the wintertime; why do so many underground piping systems display serious leaks in improperly

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made welds in the early spring?

Briefly, here is a review of basic requirements imposed on welding under various codes.

1. Design factors for welded joints: When welding was in its infancy, these factors were very low. As higher quality welding processes and electrodes were developed, these factors were reviewed and raised. Under the ASME code, we can now apply a factor of 1.0 if we can prove by radiographic examination that the weldment meets or exceeds code quality limits. When properly planned, this requirement creates no economic barrier for the reputable manufacturer or contractor.

2. Welding procedure qualification: This requirement is an assistance rather than a barrier to welding progress. If a manufacturer or contractor is to remain competitive, he must keep abreast of welding progress and apply new processes or electrodes. We cannot visually determine tensile and ductility properties of a weldment, and must conduct certain basic tests to establish these properties. The welding procedure qualification requirement in our codes only makes these tests mandatory.

3. Weldor qualifications: We would not hire an engineer or a machinist without proof of education and/or experience. Why should we hire a man and permit him to weld because he or his business agent says he is a weldor? He may have been qualified by any number of manufacturers or contractors. But unless we know the type of weld, test position, electrode type, etc., used during previous tests, we do not know whether he is capable of properly applying our procedure.

We must also remember that welding ability is a factor of eyesight and reflexes — abilities constantly changing in all of us. A reputable organization takes advantage of the weldor qualification test to determine a man's ability to fit-up, weld, follow instructions, and his general attitude under pressure.

Road to boiler safety paved by ASME

Industrial plants, commercial establishments and private homes now derive the immeasurable benefits of one of the country's most important body of rules: the ASME Boiler and Pressure Vessel Code. Written in 1915, the ASME code arose from a growing outrage over countless boiler explosions causing thousands of deaths and injuries.

One year later, to help secure legal adoption by states and municipalities of ASME code-based ordinances, the Uniform Boiler and Pressure Vessel Laws Society was formed

Forty-four years later—through 1960—one or more sections of the ASME code had been adopted in 38 states and the District of Columbia, all but one of the Canadian provinces, the Panama Canal Zone and Puerto Rico.

However, much work remains to be done.

Twelve states still have no ASME-based boiler and pressure vessel laws: Alabama, Arizona, Colorado, Florida, Georgia, Kentucky, Missouri, Montana, New Mexico, South Carolina, South Dakota and Wyoming.

Thirty-four states have laws that cover only one or more, but not all, of the ASME code sections.

A factor which virtually assures ultimate adoption of the full ASME code by all states and municipalities is the value of uniformity it provides boiler and pressure vessel manufacturers, users and insurers.

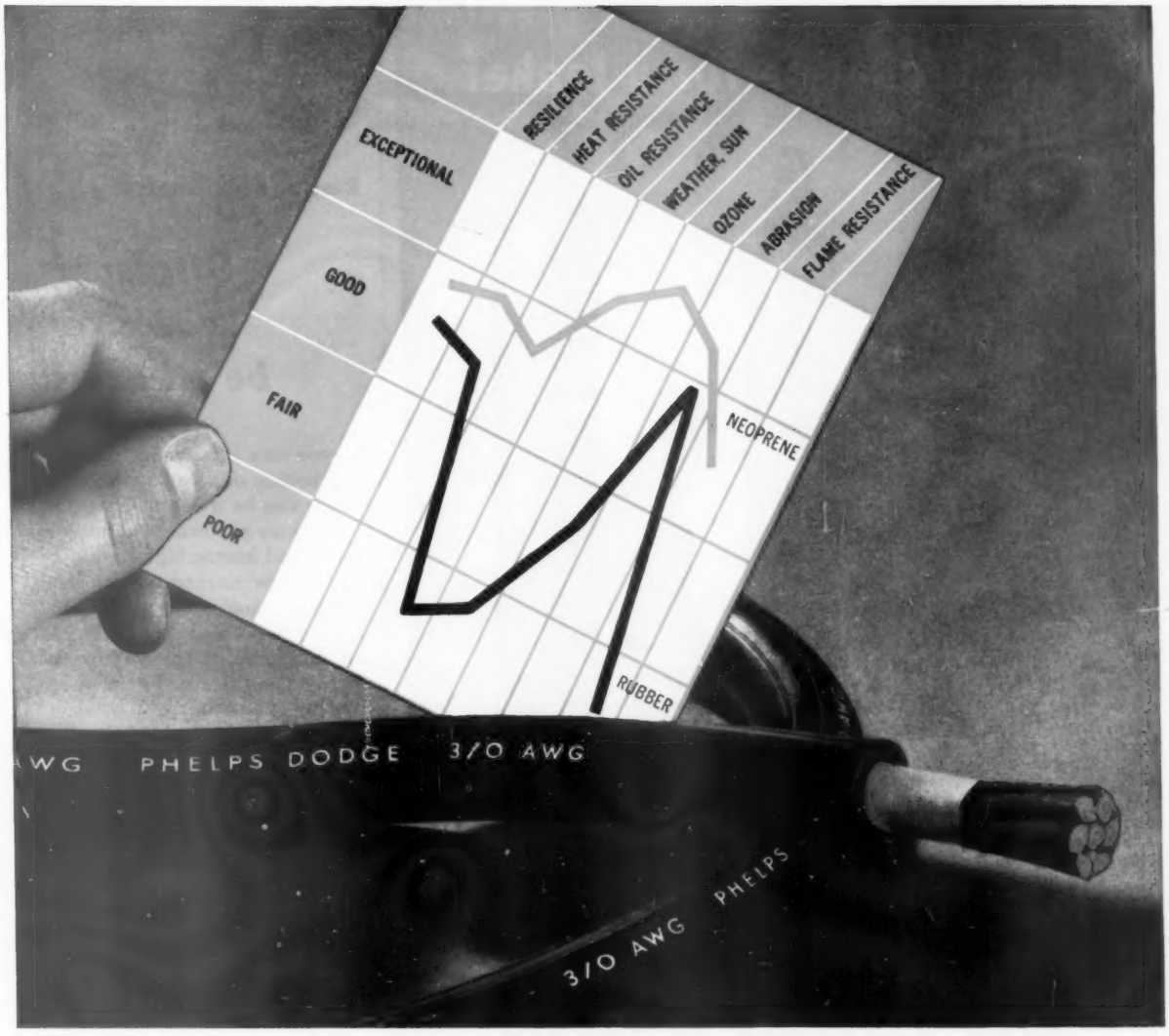
Manufacturers can achieve standardization in fabrication that enables them to peg costs accurately, avoid expensive rejects, and build to stock. Users know that a Code-conforming vessel will be well-constructed, economical and, above all, safe. Insurers, too, can rely on the safety of vessels built to ASME code requirements, enabling them to offer greater coverage at more attractive premiums.

4. Quality requirements of a completed weldment: Quality requirements of appearance, undercut, slag, porosity, etc., are routine for a properly trained and qualified weldor using a properly manufactured and stored electrode and a good welding machine. When a manufacturer of welding electrodes or equipment suggests that code requirements are too strict, we begin to wonder whether this manufacturer questions the quality of the product he manufactures.

We must remember that our various codes are not written by a few theorists who do not recognize the problems of industry. They are actually the product of many hours of hard work contributed by thousands of representatives of industries that supply or purchase code-conforming welded products.

These men fully realize that the future of our economy depends on their immediate and complete consideration of new materials and processes, plus their constant review of new data developed and submitted concerning these materials and processes. We can and must assist these various code committees by constantly furnishing them complete results of unbiased development, as well as by offering industrial support toward complete and uniform enforcement of all codes.

We can better advance welding progress by assisting in uniform enforcement of codes, rather than by offering incomplete data which supports the individual who constantly seeks a reason to ignore code rules.



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Russian researchers say . . .

Ultrasonic waves can be a hazard

IF YOU USE ultrasonics for welding, testing or cleaning, be careful; it can be a health hazard.

Workers exposed to ultrasonic waves and intense high-frequency noises show marked physiological reactions, including a tendency toward hypotension, according to an article in a recent issue of *Hygiene and Sanitation*, a USSR medical journal.

"Ultrasonic waves have been finding more and more extensive application in industry . . . and existing data demonstrates evidence of its harmful influence on the living organism."

These "waves in the inaudible range of frequencies" coupled with intense noises (such as those accompanying the testing of aircraft motors and turbojets) can cause disturbances of the "auditory apparatus and changes in the nervous and endocrine systems," according to the Soviet researchers.

The general effect of noise on the human body is manifested by fatigue, irritability, headache, moderate loss of weight, decreased work output, frequent reduction of blood pressure and other physiological changes.

Workers using ultrasonic equipment show a tendency toward hypotension, elevation of body and skin temperature, a slowing of the pulse and certain changes in the properties of blood serum proteins, it was noted. Thus, industries using ultrasonic devices should provide periodic medical examinations for their workers.

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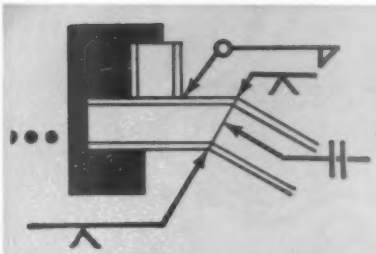

the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Re-evaluating stress relief

Question:

Recently I have heard several people question the value of stress relieving in particular operations. When is stress relieving necessary and when, if ever, can it be omitted?

Answer:

Stress relieving can be a valuable asset, a needless expense, or a definite harm, according to Louis J. Larson, Allis-Chalmers Mfg. Co., Milwaukee.

Through common usage, stress relieving of a mild steel weldment means heating it between 1,100 F and 1,200 F for an appropriate time. This does not include full annealing or normalizing.

Benefits attributed to stress relief are:

1—improved corrosion and embrittlement resistance.

2—improved machinability and machining stability.

3—improved safety and service life.

Stress relief to improve corrosion and embrittlement resistance is applicable to few weldments and, for many structures, it is unnecessary or useless.

In fabricating boilers or other equipment subject to caustic embrittlement, however, stress relief is beneficial.

The Cr steels, particularly air hardenable ones, are frequently stress relieved to reduce hardness, or increase ductility and toughness but this does not appreciably improve their corrosion resistance.

Nor is corrosion resistance of other materials — nickel, copper, aluminum, and their alloys — improved by any stress relieving.

In the case of CrNi steels, stress relief may even lower corrosion resistance.

Improved machinability by softening hard spots **is still another reason for post heat treatment.** Since air-hardened steel weldments are prone to hard areas in and near the weld due to rapid cooling, stress relieving usually reduces hardness.

In fact, in some cases stress relieving to insure machinability is a must — as in the case of welded machine tools and other equipment which must be held to a close tolerance and must remain accurate throughout their service life.

But the usual mild steels do not harden enough during welding to cause machining difficulty so stress relief is not necessary for this purpose.

The strongest reason for stress relief is to prevent premature failure by brittle fracture from residual stresses.

High residual stresses are dangerous only if the material is brittle and has a crack or other defect.

Thus, a simple solution would seem to be to choose a non-brittle material. But this is not easy because no commonly-agreed-on-test has been developed to determine if a material is dangerously brittle, and because special steels with transition temperatures below most operating temperatures are too costly for general use.

Preventing brittle fracture by eliminating all cracks and defects is also difficult. In most brittle fractures, the defect-causing failure is obvious, but in some cases it is almost impossible to locate and can probably not be detected even with the most modern inspection methods.

Therefore, reduction in residual stresses through normal stress relieving is sufficient to prevent brittle fracture.

Strictly from the safety standpoint, the need for stress relief is limited primarily to common commercial steel structures operating at or below normal room temperatures. At high temperatures, common steels are safe without any stress relief.

Many low-alloy steels with a low transition temperature are not subject to low-stress brittle fracture, and thus, do not require stress relief to insure safety.

For a few alloys and weld metals deposited by some electrodes, stress relief is actually harmful. The E12016 electrodes of NiMoV analysis show temper embrittlement after heating at normal stress relieving temperatures. This is significant when welding T-1 steel.

If the NiMoV electrodes are used for welding this steel, the weldment should not be stress relieved. If it must be stress relieved, another type of electrode — usually of lower tensile strength — should be specified.

Entire girth weld on this Thiokol motor housing is x-rayed in one exposure.

For Thiokol's Redstone Division...

the metal parts countdown starts here

Right in the first stages of missile-motor processing, the Thiokol Chemical Corporation begins its countdown with a check—by radiography—of the soundness of each weld.

Putting power plants together for the nation's space program is intricate work.

So—Thiokol's inspection of metal parts begins with the welds because any seam weakness might well let the bird fly apart.

Also—if the motor uses a solid propellant, radiography provides Thiokol with a quick, sure way to examine the charge for unseen fissures or bubbles that could cause uneven burning and erratic runs.

There are many *ways* to use radiography, but the *reasons* remain the same. Radiography saves time and money. It assures a reliable product. You needn't be a missileman to appreciate these advantages.

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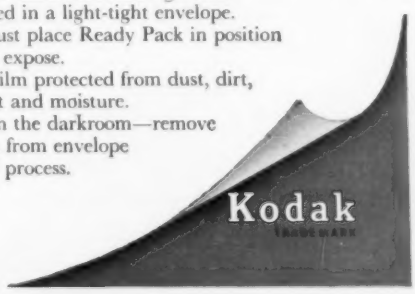
- Film protected from dust, dirt, light and moisture.
- In the darkroom—remove film from envelope and process.



Detroit to host 43rd Metal Congress and Exposition

FOR FIVE FULL days this month Detroit, the Motor City, will become Detroit, the Metalworking City, site of the 43rd National Metal Congress and Exposition.

An estimated 30,000 metalworking executives, design, product and metallurgical engineers are expected to register.

Sponsored by the American Society for Metals, the Metal Show and most of the technical sessions will be held under one roof, the city's new Cobo Hall (*see photo*) from Oct. 23 through 27.

As *WE* went to press, more than 230 exhibitors had reserved space for more than $5 million worth of equipment. The number of exhibitors is well above that for last year's exposition in Philadelphia.

Many of the displays will be presented by manufacturers of welding or allied equipment (*see box on page* 56). Among the products to be shown:

¶ A Plasmarc weld surfacing process for depositing fully-fused overlays of wear- and corrosion-resistant alloys, by Linde Co.

¶ The Multi-Wire combination welder and matched wire-feeder which will utilize all the new semi-automatic welding processes, by Hobart Bros.

¶ Pyromark high temperature paint for use as a heat-shock resistant coating with good adhesion and emissivity, by Tempil Corp.

¶ A Plant-Central system for coordinating plant and office automation through use of audio-visual controls, by Weltronic Co.

Emphasizing the show's educational theme will be the 12,000 sq ft Materials Application Center in which seven groups of engineering materials will be compared and evaluated for specific properties.

Scores of sample parts, test specimens and graphic materials will be brought together under the Metal Show Quadrillion for the exhibit.

The material groups include wrought and cast ferrous and nonferrous, special purpose, nonmetallic and composite. The evaluating properties will be strength, high and low temperature, corrosion resistance (atmospheric and processing), fatigue and general properties.

Still another attraction at the show will be the Metallographic Exhibit in which hundreds of out-

A new concept in regional shows is being introduced by ASM with its regional conference and exhibition, April 17-19, 1962 at the Shamrock Hilton Hotel, Houston, Texas.

According to ASM Managing Director Ray Putnam, the new show is designed to meet specific educational needs of the area, i.e., materials and materials processing relating to the petroleum, petrochemical and chemical industries.

To implement the concept of a purely regional personality for the event, he said, exhibitors can originate only from regional industry, distributors, agents, representatives and service companies, or from firms interested in setting up operations there.

Thirty companies have requested exhibit space as a result of a preliminary announcement. More than 10,000 general managers, company officials, production managers, supervisors, purchasing agents, design, plant and materials engineers and department heads are expected to attend.

World's largest steam surface condensers rely on M&T Murex electrodes

It takes huge condensers to handle over six million pounds of steam an hour. Right now Foster Wheeler Corporation is fabricating two of these giants for a large southern utility. Fully assembled, each weighs 800 tons, measures 82½ ft. long, 28 ft. wide, 43½ ft. high. Each unit has 300,000 sq. ft. of tube surface. In welding these twin record-breaking condensers, Foster Wheeler relied on M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING

standing metallographs from many parts of the world will be on display.

These entries will compete for the $500 Francis F. Lucas Metallographic Award. Judging will take place in 14 separate classifications with "best of class" medals and blue ribbons awarded in each. The Lucas Award represents the "best in show" metallograph.

Running concurrently with the Metal Show will be the technical program with 62 half-day sessions at which more than 200 technical papers will be presented. A record number of nine technical societies and trade associations will be participating:

ASM, 31 sessions; Metallurgical Society of AIME, 23 sessions; Society for Nondestructive Testing, 8 sessions; American Gas Association, Industrial Heating Equipment Association, Metal Powder Industries Federation, Metal Treating Institute, Special Libraries Association, and Ultrasonic Manufacturers Association. The last six will participate in joint sessions with the ASM.

The American Welding Society has given permission to a committee representing the society to organize a one-day technical session. AWS, however, is not co-sponsoring the annual affair in any way said National Secretary Fred Plummer.

The welding papers, to be presented on Thursday, Oct. 26, will cover the new processes (electro-slag, electron beam, friction welding), during the morning session, and CO_2 gas shielded welding in the afternoon.

Other technical sessions of interest to the welding-oriented visitor include a panel discussion on possible cost reductions through use of different brazing techniques (Thursday morning); highlights of recent developments in ultrasonic cleaning, machining, joining and inspection (Thursday afternoon); and the numerous nondestructive testing sessions scheduled throughout the week.

At the annual ASM Awards Dinner on Monday, Oct. 23, six major metalworking awards will be presented. Eight additional awards will be given at other special events during the convention.

On Thursday evening, Oct. 26, the ASM banquet will be keynoted by General Bernard A. Schriever, "boss" of America's missile program.

The general has been head of retaliatory warfare since April when he took command of the newly established Air Force System Command.

Among other convention activities will be the annual election of officers. Five national officers and trustees, representing many aspects of metalworking and materials industry, science, education and research, have been nominated:

Carl E. Swartz, metallurgical consultant, as national president, succeeding William A. Pennington who will serve a one-year term as trustee.

Robert J. Raudebaugh, International Nickel Co., as vice president; Joseph G. Jackson, patent attorney, as national treasurer; John A. Fellows, Mallinckrodt Chemical Works, as a trustee; and John W. Sweet, Boeing Airplane Co., also a trustee.

Elections are scheduled for the annual meeting on Oct. 25, and will be effective immediately following the Metal Congress' completion.

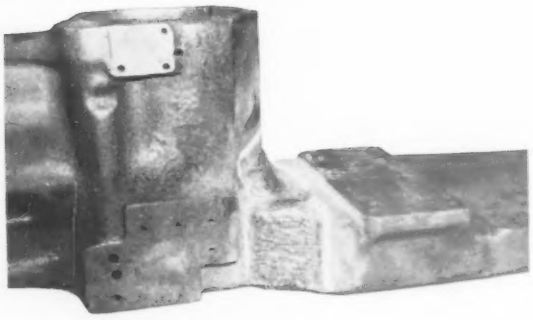
Welding and allied equipment exhibitors

Aerobraze Corp.
Allegheny Ludlum Steel Corp.
Aluminum Co. of America
American Chain & Cable Co.
American Gas Furnace Co.
American Machine & Foundry Co.
American Optical Co.
American Pullmax Co., Inc.
Bausch & Lomb, Inc.
Beryllium Corp.
Branson Instruments, Inc.
The Budd Co.
Cam-Lok Div., Empire Products, Inc.
Cavitron Equipment Corp.
Chromalloy Corp.
Copper and Brass Sales, Inc.
Curtiss-Wright Corp., Princeton Div.
Detroit Testing Machine Co.
E. I. DuPont de Nemours & Co.
Engelhard Industries, Inc.
Exomet, Inc.
General Electric Co., Lamp Metals & Components Dept.
Hamilton-Electrona, Inc.
Hevi-Duty Electric Co.
Hobart Brothers Co.
Howe Sound Co.
Kester Solder Co.
Lapeer Mfg. Co.
Lennox Tool & Machine Builders
Lepel High Frequency Labs, Inc.
Lincoln Electric Co.
Lindberg Engineering Co.
Linde Co.
Magnaflux Corp.
Markal Co.
Merit Products, Inc.
Merrill Brothers
Mine Safety Appliances Co.
Minnesota Mining & Mfg. Co.
Nelson Stud Welding Div., Gregory Industries, Inc.
Oakite Products, Inc.
Pangborn Corp.
Park Chemical Co.
Picker X-ray Corp.
Selas Corp. of America
A. O. Smith Corp.
Sperry Products Co.
Tempil Corp.
Turco Products, Inc.
United Clamp Mfg. Co.
United States Steel Corp.
Wales Strippit, Inc.
Wall Colmonoy Corp.
Weltronic Co.
Westinghouse Electric Corp.

World's tallest structure relies on M&T Murex electrodes

Almost 1000 tons of steel stretching 1676 feet into the sky! This new television transmission tower for KFVS-TV, Cape Girardeau, Missouri, is the tallest structure man has ever built. It's 204 feet taller than the Empire State Building, has solid steel legs up to 7½" in diameter, can withstand winds of over 100 mph. In welding the 30-ft sections of this triangular tower of strength, Dresser-Ideco Company put its trust in M&T Murex electrodes... products of METAL & THERMIT CORPORATION, Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING



by **John F. Donnelly**
All-State Welding Alloys Co., Inc.

Large vertical weld (above) at neck of bore column was built up to cover an area 5 by 3 3/4 in. without heat dissipation into the drill press casting. The large horizontal weld (right) resembled the vertical one because of peening, which was one of the heat control techniques used. The flat table for motor seating and upper area of bore column were cool all during the welding operation.

Casting repair-welded for less than 3% of replacement cost

CONTROLLED HEAT techniques and cast iron welding saved a cracked radial drill press from the scrap heap.

To replace the drill press at Otis Elevator Co.'s Yonkers, N. Y., plant would have cost $9,500. But cost was only part of the consideration: delivery and installation time for a new drill press of the same size would have resulted in serious down-time on a number of jobs in the shop.

Considering the careful methods required for the salvaging operations, the cost of both labor and materials ($295) was very low — less than 3% of the replacement cost.

Stress and vibration from heavy drilling operations had opened a vertical crack in the motor support base on the radial arm's rear extension. A second and larger fracture ran horizontally across the sleeve of the 10-in. ID bore column.

When fully assembled, the 900-lb. radial arm supports a drill head assembly at one end weighing more than 900 lb., and a gear box and motor with a combined weight of about 850 lb. on the other end. Having supported such weights for 30 years gives an indication of the original iron's strength.

Because of locked-up stresses, as well as the casting's size, the lowest possible heat during welding had to be maintained. Heating a broad area of the casting might release numerous stresses and send fresh cracks through the oil-and-grease saturated iron.

To obtain an accurate preheat temperature of 450 F in the immediate fracture area, the firm's weldors deposited carbon with an acetylene carburizing flame. After blackening the weld area, a neutral flame was used to burn the carbon black off. This technique not only established preheat temperature, it also burned off oil and grease from the surface to be welded.

After chamfering out a double vee grove (approximately 90 deg inside and out) along the horizontal crack, the weldors used a low-amperage ENiFe electrode manufactured by All-State to make a smooth machinable deposit.

The weld deposit was free of heat cracks and hard spots and the finished weld had better strength and elongation characteristics than the base metal. The back-weld was also machined to exact clearance in the bore.

Slightly uphill skip welding and vertical welding techniques were used to confine the heat area. Thus, during the entire welding operation it was possible to handle the casting bare-handed fairly close to the weld area.

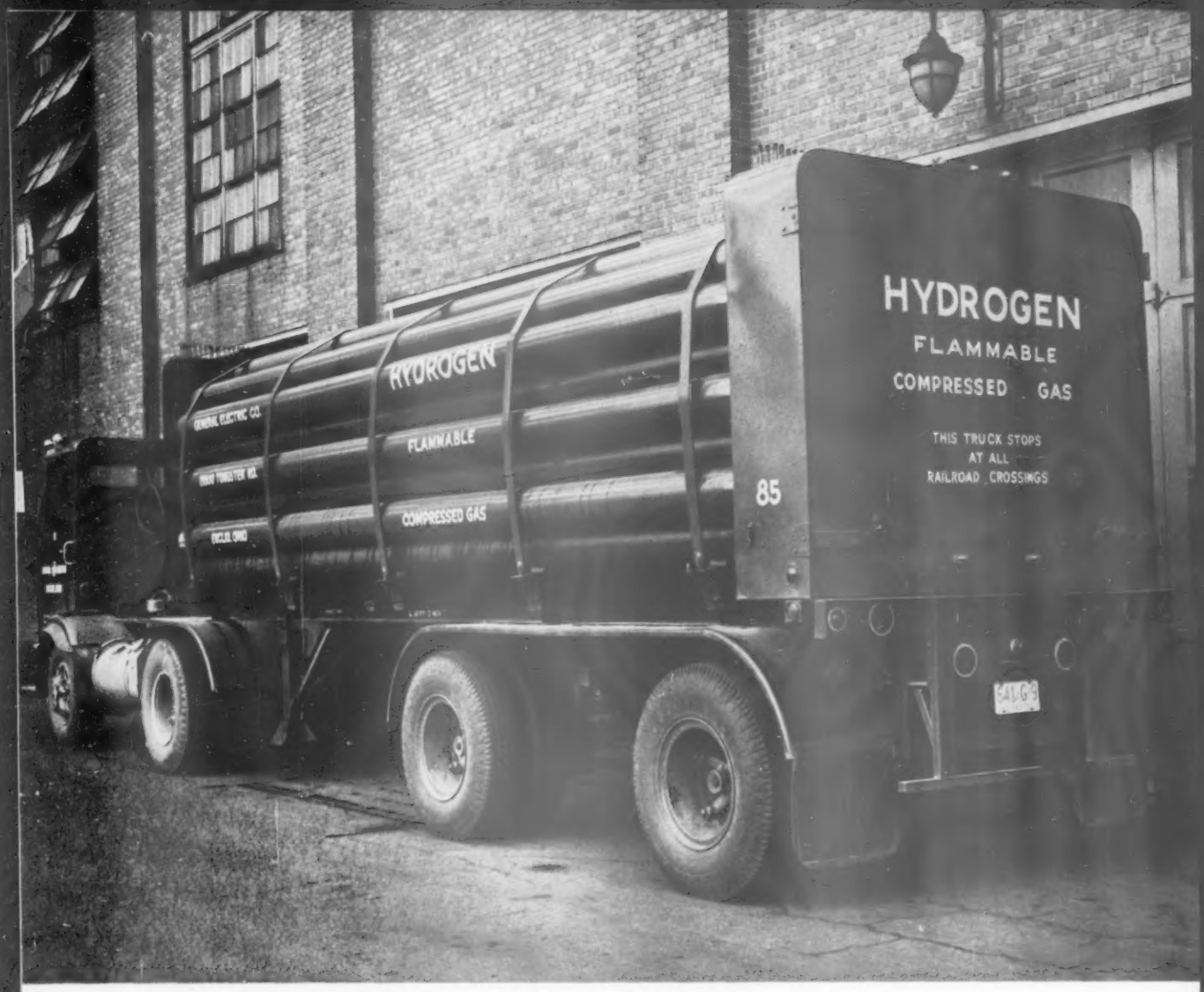
Another factor in heat control and keeping stress to a minimum was the peening of each weld pass while the deposit was still warm. Peening expanded the welds and removed tension from the fracture area while permitting a short time lapse for additional air cooling between passes.

The repaired drill press has now been in continuous operation on day and night shifts for more than 9,000 hours — without a single failure. In the first six weeks, the welds were inspected and found to be strong and ductile enough to withstand drilling vibration for all metal types using a variety of drill sizes.

World's biggest hopper trailer relies on M&T Murex electrodes

This 70-ton colossus can lug 95 cu. yds. of coal in one load. It is 47½ ft. long, 12 ft. wide, 13½ ft. high. When loaded, the trailer and its tractor weigh more than 119 tons. It takes rugged durable construction to withstand the continuous abuse this trailer takes as hundreds of tons of coal slam and pound it daily. In fabricating the world's largest hopper trailer, Marion Metal Products Co. relied exclusively on M&T Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, N.J.

M&T MUREX
PRODUCTS FOR BETTER WELDING



General Electric Company is one of the many big names in American industry which has adopted Taylor-Wharton Gas Transports as their means of transporting industrial gases.

Low initial *cost* and extreme *mobility!* — an efficiency and economy that can be found in no other means of distributing industrial gases!

Many other of the nation's gas producing, oil refining, petrochemical, food and electronic companies now employ flexible, mobile gas transports.

Why don't you? Write to:

HARRISBURG STEEL CO.
Division of HARSCO CORPORATION
HARRISBURG 8, PENNSYLVANIA

FINISHED hopper cars receive final checkover from shop inspector.

CO_2-Mig process cuts costs, man-hours per railroad car

CHANNEL support braces are welded to hopper car sides.

A FAST WELDING METHOD was required when Monon Railroad decided to build a fleet of 400 railroad hopper cars in its Lafayette, Ind., construction and maintenance shops.

Fabrication of the all-steel units called for welding channel support braces to hopper unit sides. After a production demonstration, Monon chose the CO_2-Mig welding process. Welding equipment for the project was made by Air Reduction Sales Co., New York City.

The process — using a motor generator power source which provided rising arc characteristics — yielded welding speeds of 28 ipm where previous welding procedures produced from 12 to 14 ipm of fillet weld. Approximate arc voltage was 30 at 400 amp.

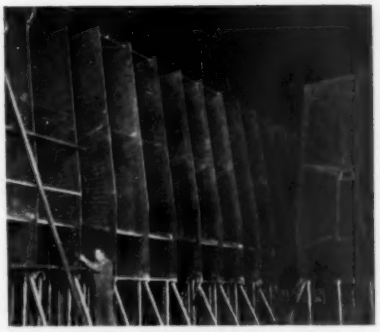
Initially, 5/16-in. steel plate stakes were flame-cut in the shops with standard torches using natural-gas cutting tips.

The 88-in. support braces were stack cut, 12 at a time, and then formed in a press. This procedure reduced costs approximately 50% from what new prefabricated support stakes would have cost.

To join the finished channel-support braces to the hopper car sides, the CO_2-Mig welding gun was mounted on a portable unit and indexed at the proper angle to make a fillet weld. Running time for a complete weld on one side of the stake averaged less than three minutes.

Throughout the operation 1/16-in.-diameter low carbon steel wire speeds were 360 to 370 ipm. CO_2 shielding gas was used at 26 cfh.

With those methods, Monon not only cut costs, but reduced the number of man hours required on the project. Only two operators were needed to weld one car side. At the height of the program, six to seven cars were produced each week for service on the road's 541 miles of main and branch lines.



Largest

Tallest

Biggest

M&T Murex electrodes weld three huge ones

On the three preceding pages, you saw three more of the rugged applications in the long list of important, demanding welding jobs recently completed with M&T Murex electrodes.

That list includes a wide variety of products, requiring many different types of electrodes. With over 1000 types and sizes to choose from, the M&T Murex line includes just about every electrode you'll ever need.

The entire listing, including *Low Hydrogen, Iron Powder* and *Stainless Steel*, is in our new "Electrode Selector." Send for it.

M&T MUREX **welding products**

METAL & THERMIT CORPORATION

General Offices: Rahway, New Jersey

Circle No. 182 on Welding Info-Aid Card

THE J. M. Winterbotham home (above) and the G. S. Gordon home (above right), Houston, Tex.: Architect — Howard Barnstone. The John Jay Hopkins Laboratory for Pure and Applied Science, Torrey Pines Mesa, San Diego (below): Architect — Charles Luckman Associates.

7 welded buildings win design awards

WELDED DESIGN has helped seven steel-framed buildings win national recognition from the American Institute of Steel Construction.

The welded buildings earned Architectural Awards of Excellence from the Institute for their designers.

The winning entries, selected from a total of 61, include a school, a faculty club, two residences, a bank and a municipal utility building.

Welded construction permitted exposed steel frames in these winners — a design trend toward economy and aesthetics.

The seven buildings are shown on these pages.

HEADQUARTERS office building of the Muninci-pal Utility District, Sacramento, Calif. (right): Architect — Dreyfus & Blackford. Southwestern Community Technical High School, Flint, Mich. (below) Architect — Eberle M. Smith Asso-ciates, Inc.

ADDITION to The Federal Savings and Loan Association, Denver (above): Architect — W. C. Morchow Associates. Faculty Club of the University of Washington, Seattle (left): Architect — Kirk ***FAIA and Associates with Victor Steinbruck AIA.***

Sellstrom Mfg. Co., Palatine, Ill.

On the lake front

Volkswagen, West Germany

WE visits Chicago's International Trade Fair

EVERYBODY likes a fair — and the more than 653,000 persons who attended Chicago's 1961 International Trade Fair recently were no exception.

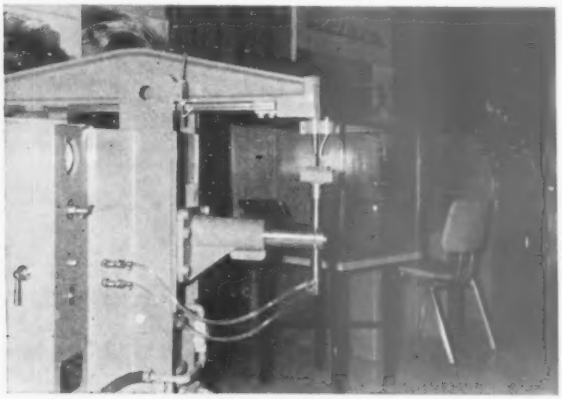
Among the exhibitors were manufacturers of welding machines and accessories, as well as a wide range of welded products (*see photos*).

Sponsored by the Chicago Association of Commerce and Industry and held in the new $35 million McCormick Place, the 17-day affair also served to bring together some 30,000 U. S. and foreign merchants.

The object: to create and develop new business opportunities in the midwest and to establish new trade and investment opportunities and relationships all over the free world.

At the lake-side exhibition hall, a total of 26 national pavilions, with some 700 exhibitors from 60 nations and the U. S. displayed $70 million worth of industrial and cultural products.

U. S. Space Capsule



Origin Electric Co., Ltd., Japan

Gevaert STRUCTURIX

INDUSTRIAL X-RAY FILM

READY-TO-USE PACKAGING:
MORE CONVENIENCE!
GREATER ECONOMY!
GEVAERT QUALITY!

UNI-PAK

Individually packaged sheets, in double-wrapped, light-tight envelopes, with cardboard stiffener. Simply remove the enveloped sheet of film from the 100-sheet carton, in broad daylight, and you're ready to shoot! Ideal for use in low Kv range *(about 130 Kv or less)* where lead screens are not normally required. *Available in a wide range of sizes, in choice of D2, D4, D7, D10 or S, for individual requirements.*

BI-PAK

Every duplex envelope contains a sheet of D4 and one of D7 film, each in its individual wrap, with a cardboard stiffener. Permits a single radiograph to be made of a subject with greatly varying thickness; D4 recording the thin portion, D7 the heavy portion. Sixty pairs to a box—extremely wide range of sizes! *Other combinations of Structurix Film in Bi-Pak packaging available on special order.*

STANDARD SIZE SHEETS AND ROLLS: Structurix Sheets are available in five emulsion types, in boxes of 75 sheets interleaved or 100 sheets NIF. Wide range of sizes! Structurix is now available in economy bulk packaging—300 sheets interleaved and 500 sheets NIF. Structurix Rolls in 16mm, 35mm, 70mm are available in D2, D4 and D10 emulsion types. *For Structurix samples, write on letterhead to nearest Gevaert Office:*

THE GEVAERT COMPANY OF AMERICA, INC.
321 West 54th Street, New York 19, N. Y.
District Offices: Lincolnwood (Chicago), Ill. • Los Angeles Dallas • Denver • San Francisco • Atlanta

GEVAERT

For more facts Circle No. 183 on Welding Info-Aid Card

ELECTROSLAG welder at British shipyard automatically welds plates in vertical position.

British electroslag welders speed caisson production

by S. T. Andrew

TWO ELECTROSLAG welders are automatically joining vertical plate at the Swan, Hunter, & Wigham Richardson, Ltd., shipyard at Wallsend-on-Tyne Northumberland, England.

In their most recent application, the machines, developed by the British Oxygen Co., Ltd., welded seams of 85 caissons for legs of an off-shore oil-drilling rig. Each 8-ft-high, 8-ft-diameter section was made from two heavy-rolled plates.

The electroslag process is arcless and depends on an electric current flowing through a pool of molten slag. The resistance of the slag to the current creates a high heat which melts the filler and parent metal to form the weld.

To produce the caissons, the welding head is first mounted on a carriage. The plates are then positioned with a 1¼-in. gap between their square-cut edges.

Next, water-cooled copper shoes are clamped inside and out with the shoes and plate edges forming a mold for the molten weld metal and slag.

Special wire is melted into the slag which in turn melts the plate edges to form the seam.

As the metal is deposited, the carriage-mounted welding head and copper shoes move automatically, governed by controls dependent on the slag temperature.

As the carriage rises, the tip of the wire in the slag bath is automatically oscillated back and forth across the gap.

Welding speed on the 1 7/8-in.-thick plate is about 7/8 ipm. About 70 lb of electrodes are consumed in less than 2 hours to weld one complete seam.

On completion, all welds were examined radiographically.

A major advantage of the process is that since it is a single-pass operation and slag remains molten, there are no time-consuming interruptions for slag removal.

The electroslag process eliminates expensive plate preparation and manipulation of the weldment. Thus, production speed is increased considerably.

Previously, heavy butt welding had been done in the flat position with plates given a U-edge preparation before welding the seam on both sides.

In addition, less wire, less flux and less current are consumed. No deslagging and no back-gouging are required when the seam has been made, and, because of the finish, little or no grinding is required.

The shipyard also found that the electroslag process gives a high-quality weld free from defects, such as slag inclusions, cracking and porosity.

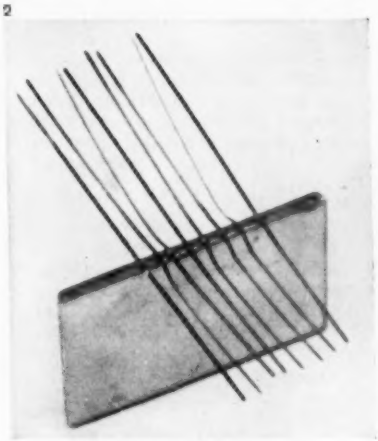
"Impossible" welds

Welds that are impossible by any other technique are now routine with Hamilton-Zeiss' high-energy density electron-beam welding. Hamilton-Zeiss equipment offers you unique performance combined with flexibility, reliability and repeatability / Difficult materials, unequal dimensions and deep penetrations present problems that only Hamilton-Zeiss welding equipment can solve with its high-energy density and precision electron-beam focusing by the exclusive Zeiss magnetic lens system. The Hamilton-Zeiss weld, created in a vacuum, offers these significant advantages: virtual elimination of contamination, close control of penetration, low thermal distortion and close dimensional control. Exhaustive tests demonstrate conclusively that welds produced by the Hamilton-Zeiss method are as strong as the original materials. Supporting metallurgical data are available for your inspection / For full information call Hamilton-Electrona, Inc., exclusive marketing agent for Hamilton-Zeiss equipment in the United States and Canada.

1

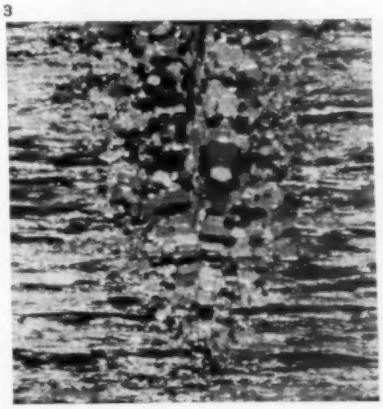
1 / Penetration study of one-inch thick Type 302 stainless steel reveals an amazing depth-to-width ratio. High-energy density and sharp focusing produce this unique weld with no reduction in the original strength of the material.

2



2 / Copper ribbon wires (0.002" x 0.010") welded to the edge of a nickel-plated ceramic substrate. This is just one demonstration of the ability of Hamilton-Zeiss equipment to weld dissimilar materials. Because of the unique design of the Hamilton-Zeiss equipment, electrons travel at approximately 212,000 miles second at the work piece.

3



3 / Study of weld on 0.100" tungsten shows minimum grain growth and no evidence of contamination. The high-energy density beam minimizes grain growth because welding time is extremely short and heat is applied to an exceptionally small zone. Contaminants are eliminated by welding in a high vacuum without filler; impurities are outgassed during the cycle.

HIGH-ENERGY DENSITY ELECTRON-BEAM WELDING BY HAMILTON-ELECTRONA, INC.

TIME-LIFE BUILDING, ROCKEFELLER CENTER
NEW YORK 20, N.Y / PHONE PLAZA 7-9548-9

22 oz. welding torch—
business end of a new system that can clobber your welding costs

This new straight-through torch is the lightest, coolest and most maneuverable you can buy . . . yet it can handle wire at speeds up to 1170 ipm.

It's part of a new Westinghouse system for thin gauge welding that combines the speed and economy of semi-automatic welding with the maneuverability of stick welding.

To back up the torch there's a new wire drive system with a vernier adjustment that permits exact feed control heretofore impossible. The power source for the package is the proven Westing-Arc RCV silicon welder with built-in Dynamic Reactor.

For more information see the opposite page . . .

Westinghouse

New Westinghouse SA-200 Welding System

Here are some of the advantages of the new Westinghouse SA-200 system:

22 OZ. TORCH has an exclusive 360° rotating nozzle that permits the operator to keep the switch in the most comfortable position for any welding job. The torch is air cooled, has a 15-foot cable, handles both mild, stainless steel and aluminum wire. It can be used with CO_2, argon or argon gas mixtures.

PRECISE WIRE SPEED CONTROL obtained from a vernier type potentiometer gives you exact wire speed required—as high as 1170 ipm. Both drive rolls are powered to provide positive wire feed.

HIGH EFFICIENCY 200 AMP RCV WELDER provides lower power consumption than is possible with any comparable system. Controlled output characteristics of this welder, combined with precision wire speed control and a highly maneuverable torch, provides the ultimate in welding gauge size materials.

THE WESTINGHOUSE SA-200 SYSTEM will enable you to have *all* of the advantages of semi-automatic welding and yet retain the versatility of stick electrode welding. All this with as much a savings as 50% in your welding cost. Designed for production welding, there is a continuous feed from a 25 lb. spool of wire, no slag removal, no stub loss, and with the highest deposition efficiency.

READY TO ADVANCE? Call your Westinghouse distributor for a demonstration, or write Westinghouse Electric Corp., Westing-Arc Dept., P.O. Box 2025, Buffalo 5, New York.

You can be sure . . . if it's Westinghouse.

J-10485

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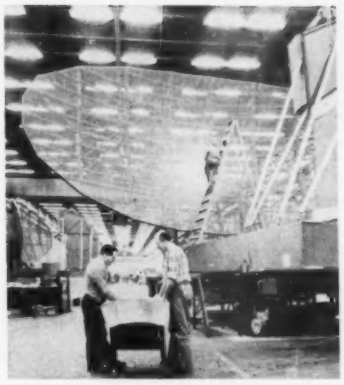

ANY weld porosity inclusion on aluminum platform (below antenna) must be less than 0.002-in. diameter to meet federal specifications.

Miles of Mig welds for radar platforms

MILES OF WELDS on platforms for seven-ton radar antennas are now being produced by semiautomatic Mig welding at General Electric Co.'s Ordnance Department.

Every platform for SAGE Continental Air Defense System radar antennas contains 1,500 to 2,000 ft. of weldments on 6061 heavy aluminum plate.

These welds are being made with 0.040-in-diameter 4043 aluminum wire produced by All-State Welding Alloys Co. Inc.

The platforms are fabricated by continuous welds — top and bottom, inside and out. At 18-in. intervals along the sides, vertical plates are welded into place. The structures are then strengthened by vertical internal aluminum I-beams.

To insure near-porosity-free welds to meet federal specifications of less than 0.002-in-diameter porosity inclusions, each welder is calibrated to the wire and a plaque is attached to show proper settings for arc speed, volts, number of passes and gas flow for any combination of material thickness.

Spot checks are then run during operation and each weld is X-rayed to insure quality.

"FLEXIBILITY" IS AUTO CRANE!

AUTO CRANE can be "CUSTOMIZED" to do any SPECIAL JOB

This is an on-the-job photograph of an actual custom-ized Model ROC-24-LC installed in a leading petroleum company's equipment welding van. Only the boom had to be changed!

• • • • •

In the above picture, the lone operator can lift an LP Gas tank to truck-bed height and place it in front of the welding unit in the back of the truck in one simple, remote-controlled operation.

All this and SAFETY too!

ALL WE NEED ARE YOUR REQUIREMENTS

Just write and tell us what your need is. Our engineers will work out a suggested plan for you.

Write today for illustrated literature, specifications and price lists on all models of AUTO CRANE.

Never a strain-with Auto Crane

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Circle No. 186 on Welding Info-Aid Card

Adhesives may solve your bonding problems

by H. R. Butzlaff and K. F. Charter

*A. O. Smith Corp.**

ALTHOUGH ADHESIVES WERE used by the ancient Egyptians, effective metal-bonding with such materials is relatively recent.

Today adhesives are being used to produce such diverse items as auto brake linings and aircraft wing cores, and they promise even wider use in the future.

If you are planning to use adhesives or have even considered them, there are some basic facts you should know in addition to proper joint designs (See Figure 1). Adhesives do offer a variety of production and design advantages but they also have a number of distinct disadvantages.

First, consider the advantages:

1 — Loads are distributed equally with smooth contours, and gaps and voids are minimized as are stress concentrations.

2 — Aluminum and magnesium are not embrittled; steel does not tend to warp.

3 — High temperatures are not required for bonding.

4 — Stresses created by flexing and differences in coefficients of expansion are absorbed.

5 — Dissimilar metals and materials can be joined.

6 — Bonded joints dampen vibration.

7 — Designs which reduce metal forming and metalworking can be used.

8 — Large areas can be bonded in a relatively short time.

9 — Good surfaces for organic coatings can result.

10 — In addition to bonding, a sealing action is provided.

11 — Easier alignment of joined parts can be achieved.

12 — General weight can be reduced.

13 — Bonds which can give electrical insulation and thus minimize galvanic corrosion can be produced.

On the other hand, there are many factors which may detract

*From a paper presented at The American Society of Mechanical Engineers' Design Engineering Conference.

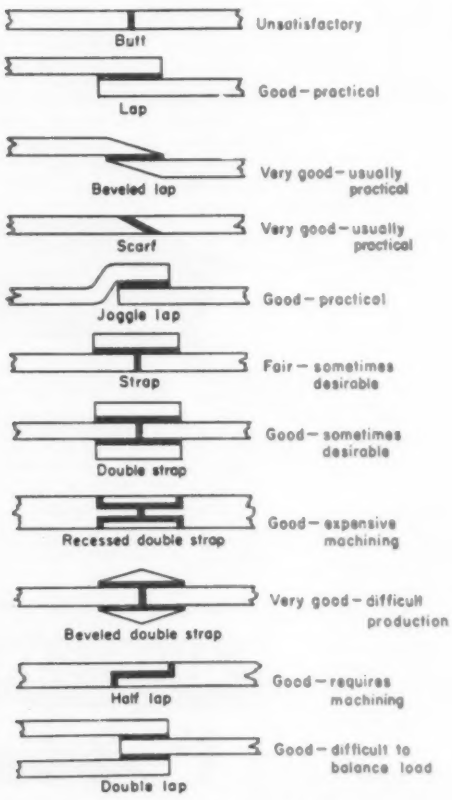


FIG. 1 — Adhesive bonded joint designs.

Classes of adhesives

ADHESIVES FROM RECLAIMED RUBBER — Reclaimed rubber-based adhesives provide shear strengths from about 50 to 300 psi at room temperature. However, they are thermoplastic and their strength decreases as the temperature rises.

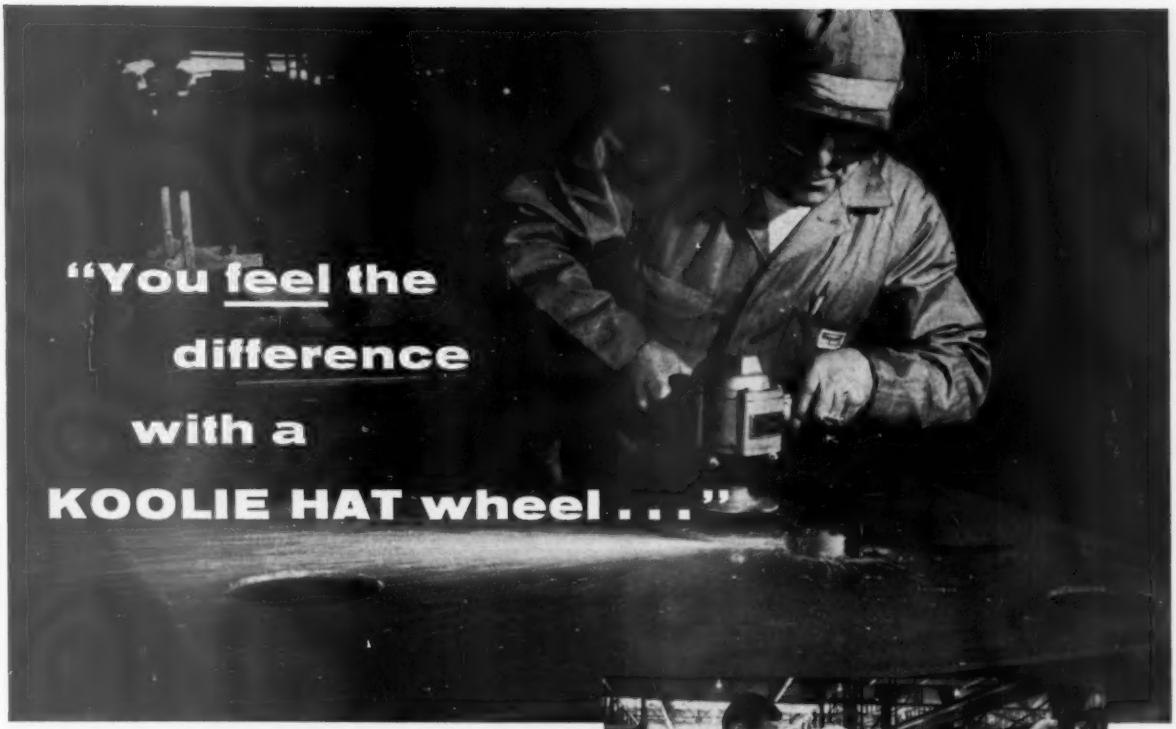
OIL-SOLUBLE ELASTOMERS — Most of these are translucent and light colored. They develop shear strengths at room temperature from about 30 to 200 psi though some have a tendency to flow or creep under constant high stress.

OIL-RESISTANT ELASTOMERS—Heat cured products of this kind will develop strengths ranging from 500 to 3,000 psi, whereas uncured products will develop shear strengths in the 200 to 1,000-psi range.

ADHESIVES FROM NATURAL RESIN — These are inexpensive, low performance products for non-critical usage.

SYNTHETIC RESINS — Generally adhesives derived from synthetic resins can resist aromatic fuels, solvents and water while providing relatively high strengths. One part epoxy-base adhesives can develop metal-to-metal bonds with shear strengths in excess of 5,000 psi.

RESIN-ELASTOMER FILMS — These require a combination of heat and pressure to cure and actuate, but they can develop shear and tensile strengths which exceed 10,000 psi and resist temperatures of 350 F and higher.



"I can work almost half again as long without getting an ache in the wrist and arm muscles," says Walt Via (shown above grinding a Utility Trailer king-pin assembly).

"... even after a long stretch of grinding, I'm not tired. Its unusual shape makes grinding hard-to-get-at spots easy." That's what Operator Walter Via says about the Koolie Hat wheels he's been using at Utility Trailer Manufacturing Company, Los Angeles, one of the West Coast's biggest manufacturers of custom-built trailers.

Here's *why* Bay State's unique reinforced resinoid disc-wheel is the least fatiguing, fastest, safest wheel on the market:

Easier Operation "Koolie Hat" wheel is held at 4° to 5° angle instead of 25° to 30°, requires less pressure, virtually eliminates jitter and bounce.

Extra Safety "Koolie Hat" shape wears evenly over all three abrasive layers instead of one at a time. Less danger of shattering due to heat cracks or thinning of wheel.

More Uniform Speed Narrow radial contact surface between "Koolie Hat" wheel and surface keeps speed high for fast, efficient metal removal without heat build-up.

If you want to give your operators (*and* your profit curve) these advantages, get the full story from your Bay State distributor or direct factory representative. *Better grinding at lower cost, that is their business.*

Bay State representative Emil F. Rogers (left) shows the unique shape of the Koolie Hat wheel to Utility Trailer's Director of Purchasing, Virgil D. Waters (right) and Lead Operator Walter Via (center).

NEW U-grade formulation complements original "Koolie Hat" R-grade wheel, ensures extra-long life when grinding all materials with higher speed grinders operating at 5200 r.p.m. or above.

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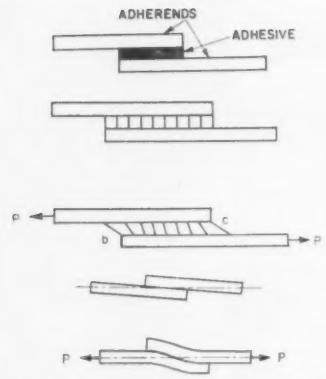

FIG. 2 — Lap joint (top); Differential strain in a lap joint (center); Bending of adherends in a lap joint (bottom).

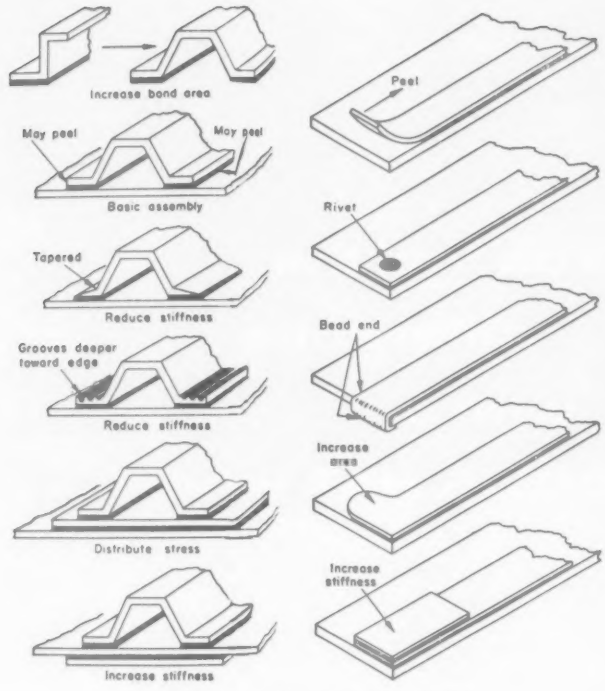

FIG. 3 — Joint designs to minimize peel.

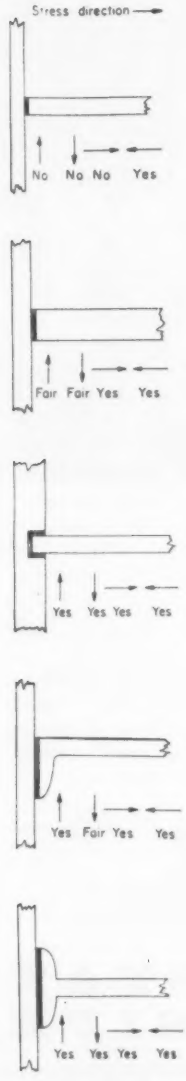

FIG. 4 — Joint designs to minimize cleavage.

from the value of adhesives:

1 — They are not as stable as metals.

2 — Heat and pressure may be required to cure them.

3 — Expensive jigs and fixtures for applying heat and pressure may be needed.

4 — They may be susceptible to high humidity and/or low temperatures.

5 — Extensive tests for durability and permanence have not been conducted.

6 — Strong, reliable bonds are produced only on clean surfaces.

7 — Extreme forming time may often be required adding unreasonable costs.

8 — They are difficult to inspect or test non-destructively.

9 — Other joining methods may be stronger.

In an adhesive bonded joint, stress concentrations are produced just as they would be in an unfilleted weld or braze. Two factors are primarily responsible for these stress concentrations:

1. Differential strain of the joined members.

2. Bending of the joined members.

Since plain lap joints are easy and common in manufacturing with adhesives, most of the engineering data on bends and strains in metal-to-metal bonds have been obtained as shear strengths with plain lap joints.

The lap joints in Figure 2, designed to demonstrate differential strain, show each member bearing the full load, P, just before the joint and transmitting it gradually to the other through the adhesive. Thus, the stress of the upper adherend is highest at b and gradually diminishes until it is zero at c.

However, in the lower member, the stress is greatest at c and diminishes to zero at b. These members, obeying the laws of elasticity, develop strains proportional to the stresses. This results in higher stresses in the adhesive at each end of the overlap.

Members of the lap joint are offset by their thickness giving rise to a bending movement which tends to pull the members apart. (See Figure 2). These mem-

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bers will yield if the applied load is great enough.

The tearing or peeling stresses are concentrated at the ends of the overlap. Combined with the effects of differential straining, these stresses considerably reduce the strength of lap joints.

A number of joint designs have been proposed for adhesive bonding to rectify these problems (Figure 1). The scarf and bevelled lap are most efficient because they reduce the concentration of stresses at the ends of the overlap.

In production, however, the bevelled and scarf joints are expensive and are not generally recommended.

Parts to be bonded with adhesives must be designed properly to obtain maximum strength and this design is dependent on the direction and magnitude of the load and the types of stress.

For properly designed adhesive-bonded joints, peel stresses and cleavage stresses should, therefore, be kept to a minimum (See Figure 3 and Figure 4).

As far as research is concerned in determining the value of various designs, most of the present data on adhesive bond strength has been obtained with aluminum or aluminum-alloy adherends because most structural adhesive applications to date have been in the aircraft industry. There is little data on steel-to-steel adhesive bonds.

One laboratory has been studying the effects of temperatures from -100 to +1,000 F on the strength properties of seven commercial metal bonding adhesives. Lap shear, longtime load, peel and fatigue tests have been made and tensile shear strengths of 2,300 psi at 350 F and over 1,000 psi at 500 F have been reported.

The strength of these lap shear joints is also dependent on the thickness of the glue line. Optimum glue line thickness appears to be about 4 to 6 mils, but varies with the adhesive used.

It has also been found that the fatigue strengths of lap shear joints at -65 to 70 F are very nearly equal to those at room temperature. Also, most of the failures at the low stress levels are in the metal rather than in the adhesive bond.

Tests have also shown that the rosetting phenolic-synthetic rubber adhesives tend to show stronger bonds at high temperatures than do other adhesives.

The improvement of bonded structures over riveted structures in fatigue in aircraft and other equipment is a major advantage of adhesive bonded joints. On a fatigue test in helicopter blade skin with adhesive-bonded stringers and local rivet reinforcings for attaching the skin to the rib structure, failure took place by a crack developing at a riveted joint after 150 million cycles of reversed stress. The adhesive bond had not failed.

As information on the permanence of metal to metal bonds with adhesives becomes more readily available, we can expect wider use in a variety of applications.

Adhesives have a lot to offer if used properly, and we are rapidly learning how to use them.

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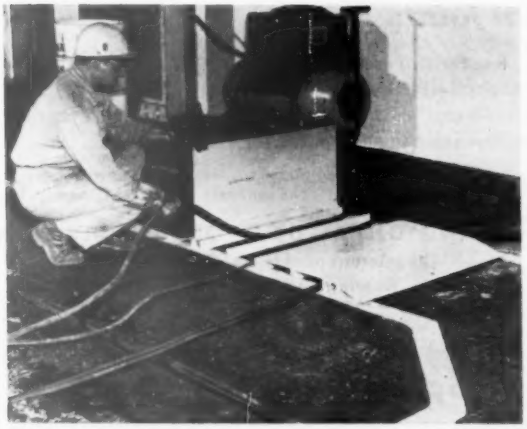
Below — When cables from a welding unit cross a walkway, this portable shield is set up to eliminate a temporary tripping hazard and protect cables from wear and tear of traffic.



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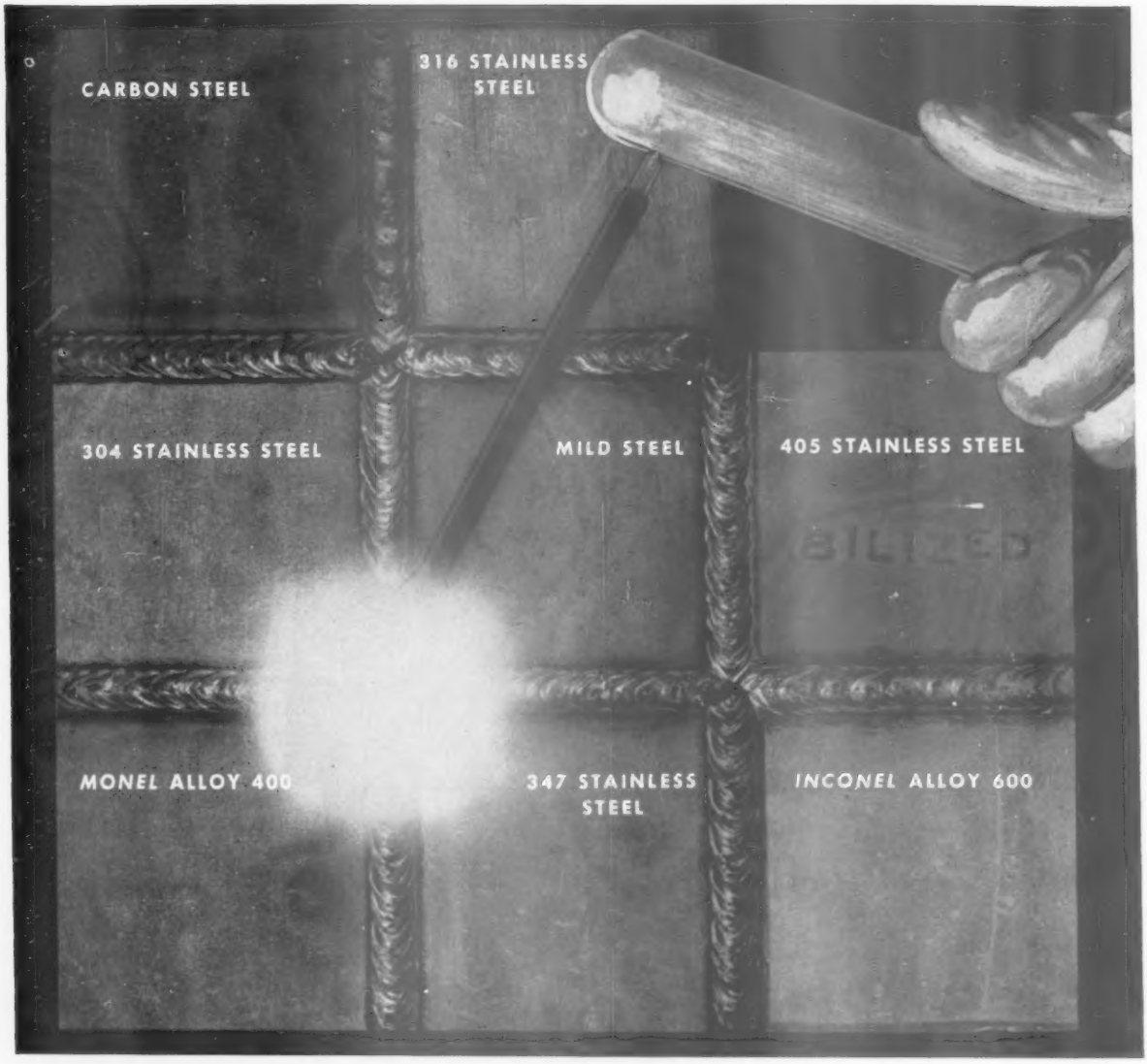

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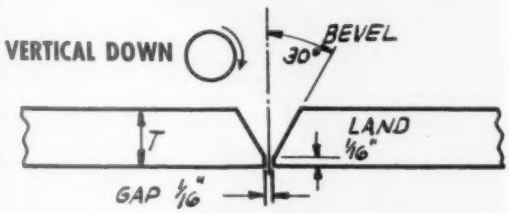
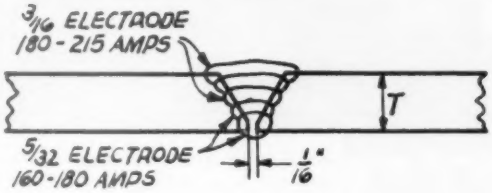
Estimating electrode consumption



Pipe Wall Thickness	No. of Passes Note 1—	Speed—Note 2— Ft/Hr
1/4	3	20½—21½
5/16	4	15½—16½
3/8	5	11½—12½
1/2	7	7 — 8

E6010 and E7010 Electrode



NOTE 1: The number of passes will vary depending upon the operator. However, the feet of joint welded per hour should not vary greatly.

NOTE 2: Speed is the number of feet of joint completed per hour based on actual arc time and 100% operating factor.

NOTE 3: On vertical up joints actual arc time is nearly the same with E6010 and low hydrogen electrode with low hydrogen slightly faster. However, low hydrogen electrode requires less

One extra stripper bead may be required especially at the 3–5 o'clock position.

PIPE DIAM-ETER	WALL THICKNESS—T											
	1/4"			5/16"			3/8"			1/2"		
	† ELECTRODE REQUIRED PER JOINT											
	5/32	3/16	Total	5/32	3/16	Total	5/32	3/16	Total	5/32	3/16	Total
6	.47	.24	.71	.47	.47	.94	.47	.75	1.22			
8	.63	.32	.95	.63	.63	1.26	.63	1.01	1.64	.63	2.04	2.64
10	.79	.40	1.18	.78	.78	1.56	.78	1.14	2.02	.79	2.39	3.26
12	.95	.47	1.42	.95	.95	1.90	.95	1.50	2.45	.95	2.98	3.93
14	1.1	.55	1.65	1.1	1.10	2.2	1.10	1.75	2.85	1.10	3.47	4.57
16	1.25	.63	1.88	1.25	1.25	2.5	1.25	2.01	3.26	1.25	3.96	5.21
18	1.4	.70	2.10	1.4	1.4	2.8	1.4	2.27	3.67	1.4	4.5	5.9
20	1.5	.76	2.26	1.56	1.56	3.12	1.56	2.44	3.94	1.5	4.8	6.3
22	1.7	.90	2.60	1.7	1.75	3.5	1.7	2.85	4.5	1.7	5.5	7.2
24	1.9	.94	2.84	1.9	1.9	3.8	1.9	3.0	4.9	1.9	6.0	7.9
26	2.0	1.10	3.1	2.05	2.05	4.1	2.0	3.30	5.3	2.0	6.5	8.5
28	2.2	1.10	3.3	2.2	2.2	4.4	2.2	3.54	5.7	2.2	7.0	9.2
30	2.35	1.17	3.52	2.35	2.35	4.7	2.35	3.8	6.1	2.35	7.5	9.8
32	2.5	1.28	3.78	2.5	2.5	5.0	2.5	4.1	6.6	2.5	8.0	10.5
34	2.7	1.30	4.0	2.7	2.7	5.4	2.7	4.3	7.0	2.7	8.5	11.2
36	2.8	1.41	4.22	2.8	2.8	5.6	2.8	4.5	7.3	2.8	9.0	11.8

†"Electode required" figures in the table include four-inch stub lengths. These figures will vary with different stub loss practices.

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For ICBM fuel loading operations and high-velocity hot water jobs . . .

Hardfacing adds life to control valves

CONTROL VALVES EXPOSED to flashing condensate will last much longer if you hardface the trim areas.

That's what Kieley and Mueller, Inc., Middletown, N.Y., has determined. The firm makes power-plant type valves for a variety of high-velocity hot water operations.

When pressure is changed in these valves, part of the water flashes into steam, increasing velocity. The steam-water combination's velocity increases still further as the valves are throttled.

To prevent leaks and increase valve life, the company hardfaces seating surfaces with RCoCR-A rod manufactured by Haynes Stellite Co., New York.

A second valve — designed for fuel loading operations for the Atlas ICBM — has all trim areas hardfaced to withstand the extreme pressure drops which send the fuel through at high velocity.

The firm also makes an automatic valve designed to withstand throttling motion for 90% of operating time. To protect the guide post and bushing from wear under the constant motion of the valve, contact areas of both parts are given a ¼-in. hardface deposit.

A ¼-in. alloy hardfacing deposit is laid down on valve seat to protect it from wear.

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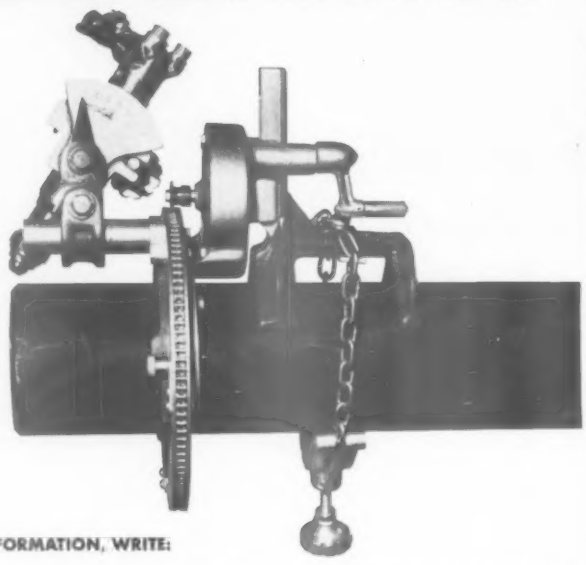

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News

. . . from page 8

Airco builds longest U. S. nitrogen pipeline

Air Reduction Sales Co., New York City, is building the longest nitrogen pipeline in the United States.

The pipeline will be used to bring high-purity nitrogen in large quantities to plants in the Delaware Valley chemical complex. The 22-mile pipeline will originate at Airco's $6½ million air separation plant now under construction on a 9-acre site at Claymont, Del.

Tweezer-Weld Div. Adds 6,000 sq ft

The Tweezer-Weld Div. of Federal Tool Engineering Co., Cedar Groove, N.J., is erecting a 6,000-sq-ft addition to its plant.

The added space will be used primarily to accomodate the increase in the firm's sub-contract welding of semi-conductors and other electronic sub-assemblies.

O.K.I. sends employees to Ohio State University

O.K.I. Supply Co., Cincinnati, has enrolled two of its employees in a 2-year wholesale management development program at Ohio State University.

The pilot program at the university is designed to prepare young men for positions of responsibility in the wholesale industry.

Hobart consultant takes European sales trip

Peter C. Hobart, international development consultant of the Hobart Bros. Co., Troy, Ohio, is on an extensive European sales trip.

Hobart will contact distributors throughout Europe and will attend a number of trade fairs.

Inco expands facilities for long-length tubing

An $8 million expansion of production facilities is enabling the Huntington Alloy Products Div. of International Nickel Co., Inc., to increase production of long-length tubing and other tubular products.

Various nickel alloys, nickel-copper alloys and nickel-chromium alloys are being extruded and cold drawn into tubing up to 85-ft long.

NCG acquires assets of Western Slope

All assets of Western Slope Oxygen Co., Grand Junction, Colo., have been acquired by National Cylinder Gas Div., Chemetron Corp., Chicago.

Passes are available to Chicago Atom Fair

Special passes for business, scientific, industrial and government personnel to AtomFair-61 are now available.

AtomFair-61 will be held November 6-9 at the Conrad Hilton Hotel, Chicago, in conjunction with the annual meetings of the Atomic Industrial Forum and the American Nuclear Society.

Passes are available from the Forum at 850 Third Ave., New York 22, N.Y.

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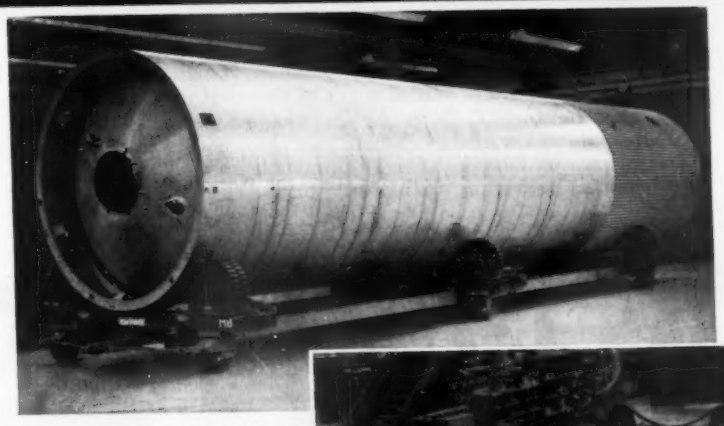

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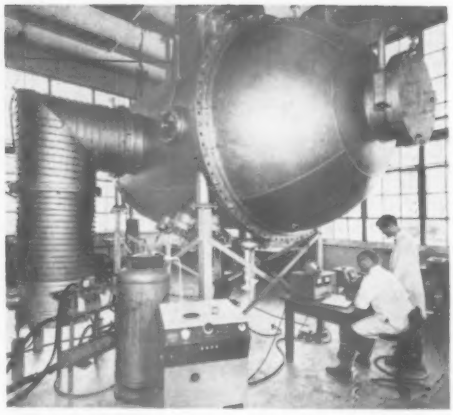
In Summary . . .



A welded stainless steel vessel at **Chicago Bridge & Iron Co.,** (see cut) is being used to simulate conditions at 800,000 ft altitude. The 8-ft-diameter 18-ft-long vessel can attain a pressure of 5 x 10^{-7} millimeters of mercury . . . Chicago Bridge has also recently formed new companies in Australia and France to furnish metal plate storage tanks and processing structures . . .

American Brazing Alloys Co., Pelham, N. Y., is completing a 12,000-sq-ft plant for flux coating and wire drawing, spooling, straightening and cutting . . . **The Du Pont Co.,** Wilmington, Del., has acquired rights from the Government of Australia for the development of an Australian system of improved chromium alloys for high-temperature applications . . .

Dorcon Inc., a wholly-owned subsidiary of **Dorr-Oliver Inc.,** Stamford, Conn., has been formed to design, produce and fabricate metal tanks, water and chemical storage facilities and process and reaction vessels. . . . . **Sperry Products Co.,** Danbury, Conn., has presented a gift of technical nondestructive testing equipment to Sacramento State College. . . .

A publication titled "Colors for Identification of Arc-welding Electrodes" is available from the **National Electrical Manufacturers Association,** 155 E. 44th St., New York 17, N. Y. The booklet is 25¢ per copy and minimum order is $1. . . .

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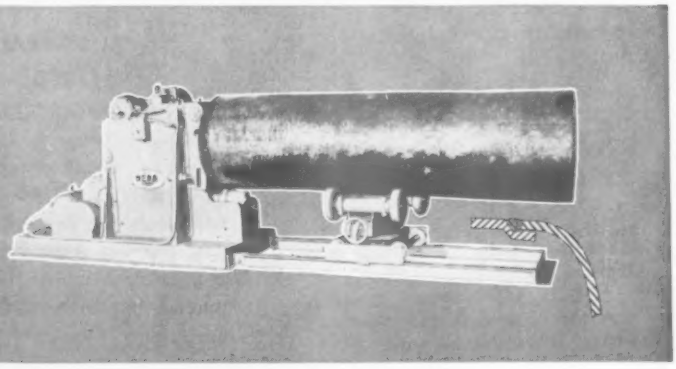
With standard dies.
New M 2-P pipe duty 6" to 30" up to ¼" thick.



WEBB ASSEMBLY PRESS
Companion fixture for assembling heads to shells — shells to shells.
• 25 tons closing pressure • Built-in fit-up rolls • Built-in kick-out lift • Adjustable for tank diameter and length
3 standard sizes to handle up to 72" diameter
Combination Assembly and Girth Welding Machines also available.

The McKay Machine Co., Youngstown, Ohio has been licensed to manufacture lines of metal processing equipment formerly made by the **Wean Equipment Corp.**, Cleveland. . . . **Olin Mathieson Chemical Corp.** is planning a multi-million dollar program to modernize its brass operations and raise production capacity. This plan includes construction of a new casting and rolling plant in East Alton, Ill. . .

The Harris Co., Inc., North Haven, Conn., dealer for the **National Cylinder Gas Div., Chemetron Corp.**, has opened a branch office at 343 Main Street in Agawam, Mass. . . . . The Department of the Navy Yards and Docks has awarded a contract to **Dalweld Co., Inc.**, Mt. Vernon, N. Y., to supply brazing alloy to Naval shipyards throughout the United States.

Bow Solder Products Co., Inc., Brooklyn is now a wholly-owned division of **Alloys Unlimited Inc.**, Long Island City, N. Y. The division is now called **Alloys Unlimited Solder Corp. . . . Chase Brass & Copper Co.**, Waterbury Conn., a subsidiary of **Kennecott Copper Corp.**, is now producing rhenium-tungsten rod and wire . . .

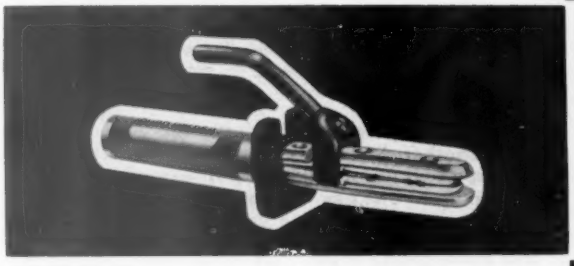
Narda Ultrasonics Corp., Syosset, N. Y., has changed its name to **Dynasonics Corp. . . . Hendersonville Welding & Supply Co.**, Hendersonville, N. C., has also changed its name. The firm is now **Andy-Oxy-Co. . . .**

Cities Service Helex, Inc. New York, has been awarded a federal contract for extraction of helium from natural gas. Under the contract, the government will buy up to $9,100,000 worth of helium annually for 22 years . . . **The American Institute of Mining, Metallurgical and Petroleum Engineers, Inc.**, has moved its offices to 345 E. 47th St., New York 17, N. Y. . . .

Selas Corp. of America, Dresher, Pa., will produce all the furnace equipment required for the National Supply Div. of **Armco Steel Corp.**'s new combination pipe mill. The pipe mill at Ambridge, Pa., is designed to make electric resistance welded pipe, seamless pipe and continuous butt weld pipe made by a new method. . .

DURO ELECTRODE HOLDERS

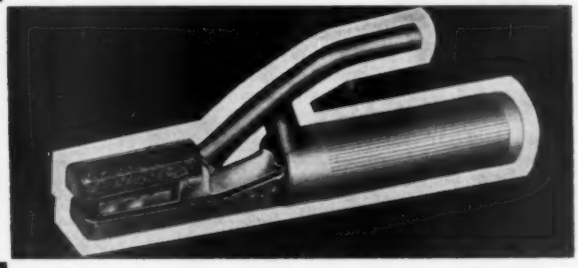
THE DURO "STANDARD"



- Jaws designed to reach hard to get at places.
- Cool operation—cool handling.
- Fully insulated to protect the operator.
- All parts easily replaced.

For further information and name of nearest distributor write:

THE "ADJUSTABLE TENSION"



- Easy adjusting of Spring Tension for your requirements.
- New type cable connection prevents fraying of cable.
- Made in Bronze or Light Weight Aluminum models.
- All parts replaceable including copper alloy jaw.

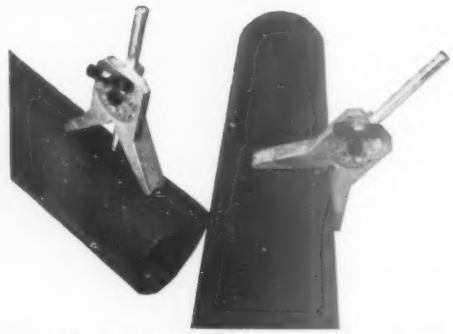
THE DURO ENGINEERING COMPANY

71 Oregon Avenue, Hamden 17, Connecticut

For more facts Circle No. 194 on Welding Info-Aid Card

CURV-O-MARK

Centering Heads



Actually, it's five tools in one — replaces protractor, centering head, center punch, level and scale. Y-Type head is accurately machined with tangents and tips to serve in centering and aligning. Dial Set Level is marked in 2½ and 10 degree graduations for easy reading Punch is of drill rod, with special point for long service.

Flange Aligning Tool

This self-centering tool makes pipe line construction faster and more accurate. It is quickly adjustable for all type flanges or pipe sizes ranging from 3 to 12 inch diameters. After easy insertion into pipe, Flange Aligning Tool centers itself snugly against the inside pipe diameter and automatically aligns with pipe axis.

Protractor

The ANG-LO-CATOR Protractor is the only measuring device that quickly and accurately determines correct degree of angle on any pipe or structural material, regardless of size. A valuable aid to welders, structural workers and pipe fitters. Size 4" x 8".

RADIUS MARKER

The Standard Radius Marker folds to pocket size. This sturdy, folding Radius Marker has a span of 24" and easily swings a 48" circle or arc.
The Jumbo Radius Marker is also the folding type, has a span of 48" and easily swings a 96" circle. These tools are precision made of rust proof aluminum Jural.
The Standard Radius Marker folded, measures only 9¼" in length, weighing only 8 oz. The Jumbo model, of course, is larger. Both are equipped with special spring washers to maintain accuracy and rigidity for years of service. Pencil holder is made to hold round or flat pencils, soapstone, or steel point.

CONTOUR SALES CORPORATION

1843 E. Compton Boulevard Compton, California

Reprints still available from WE

Reprints of certain articles published in Welding Engineer are still available. A list of these appears below. Reprints may be obtained for 15 cents each, except where otherwise noted. Payment must accompany all orders. For quantity orders, write for special prices. Order by title from: Reprint Editor, Welding Engineer Publications, Inc. Box 28, Morton Grove, Ill.

Design for welding

Basic knowledge required when designing or redesigning for welded construction is detailed and discussed. Sixteen page reprint includes 11 data sheets.

The meaning of weldability

Weldability of carbon steels and alloy steels, as well as some other metals, is discussed. Sixteen page reprint includes three data sheets.

How to weld T-1 steel

Explains how to weld this high-strength low-alloy metal. Includes a data sheet on T-1 mechanical properties.

Fundamentals of oxyacetylene welding

Gives the basic essentials on and primary steps of oxyacetylene welding.

Uses of build-up electrodes

As rebuilding and reclaiming of worn steel parts becomes standard maintenance procedure, build-up electrodes increase in importance. This 2-page reprint lists the qualities necessary for a good build-up material.

A guide to preheat

This 4-page reprint on benefits of preheat includes an engineering data sheet entitled "Recommended preheat for steel alloys."

Acetylene

A 12 page salute to the IAA and acetylene, details the great success of this gas. Includes a history of the IAA and "The Acetylene Journal."

Filler metals for brazing

Brazing filler metals are detailed and each group is analyzed. Includes data sheet on how to select silver brazing alloys.

Explosive welding and forming open another door

A report on one of the newest entries into the welding industry, and how one pioneer company turned theories and practices into realities.

Our modern-day mythology

A rebuttal to some old-wives tales about the hazards of welding fumes, plus safety recommendations for situations where hazards might develop.

Welding the reactive metals

This 12-page reprint describes techniques for Tig welding titanium, zirconium and tantalum. It also gives experimental data on resistance spot welding of tantalum.

Welding 17-4 PH stainless steel

Sound joints can be easily produced in 17-4 PH stainless by proper welding practice. This 4-page reprint details all phases of the procedure.

Non-destructive testing

Four separate articles comprise this 8-page reprint on non-destructive testing: how to interpret radiographs; circumstances and job requirements govern selection of radiation source in inspection; ultrasonic testing; and a program for radiation safety.

Reprints continued . . . .

Welding thoriated magnesium

Development of specialized machinery and techniques for joining new magnesium alloys, especially thoriated types, has aided in the production welding of such materials. This 4-page reprint includes tables on mechanical properties and on weld defects and how they affect weld strength.

Instructions for welding moly

Molybdenum has a melting point of 4,730 F, which makes it ideal for high-temperature service in planes, missiles and nuclear reactors. This report gives welding data resulting from six years of experimental work sponsored by the Office of Naval Research. This reprint free.

Effect of arsenic on welds

A study of arsenic's effects on the mechanical properties of welds in mild steel was directed specifically toward a determination of arsenic's role in behavior of welding fittings. Results are revealed in this 4-page reprint.

Stress relieving

Stress relieving can be an important manufacturing operation or a needless expense item. This 4-page reprint is intended to help you in making a correct decision in the matter.

Fixtures for brazing

Presents requirements for designing brazing fixtures and materials to be used. Data sheet on properties of non-metallic fixture materials included. Free.

Determining strength of fillet welds on angles

This 4-page reprint gives the method of determining the correct weld size and length for the most economical strength, joint efficiency, and margin of safety.

How to simplify machine bracket design

This reprint explains the welding advantages of machine bracket design, including diagrams with explanations.

How to get better stainless steel welds

4 page reprint explains the procedures for better stainless welds giving certain basic fundamentals that will spell the difference between success and failure on a job.

Comparative testing confirms oxypropane cutting value

4 page reprint discusses the use of propane as a fuel gas in the oxygen cutting of steel compared to oxyacetylene cutting. Its economic advantages and appearance of workpiece are also discussed.

Induction heating for stress relief

This 4 page reprint explains techniques that can prevent cracks in welded areas through stress relieving. Also includes a chart for computing power and cable length for stress relieving.

How to design for preform brazing

Another 4 page reprint showing how joints properly designed for brazing preforms can help achieve good results. The reprint has 24 figures showing the types of brazing preforms.

Welding heat is chief factor in determining weld quality

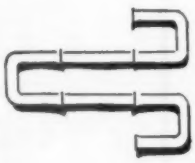
Explains the weld heat efficiency of base metal and its importance and how to use it. Includes charts and data sheet.

GOT A JOINING PROBLEM?

Having trouble with corrosion? Dissimilar or unusual metals? Successive joints on the same work? We'll tackle it . . . at no cost to you.

Tough joining problems gave this company its start. Every time we solved a problem we had a new customer . . . and often a new product to sell! That's how we got into the special alloys business in 1946. That's how we grew.

FOR EXAMPLE



Automobile air conditioning units called for a low-cost but highly corrosion resistant heat exchanger with freon-tight seals in aluminum tubing. ALL-STATE developed a cadmium-zinc alloy that was low in cost, resistant to all atmospheric conditions, and leak-proof. Same alloy now used for repair of automobile radiators.

Our 430° non-acid flux was developed for joining stainless with minimum hazard to users. A subsequently discovered application was joining Hydro T-metal without discoloration.

It took months to figure out how to braze the cathode wire to the terminal inside radio vacuum tubes without blackening the inside of the tube. Our silver-copper-indium alloy lowered brazing temperature without increasing vaporization rate, solved the problem.

Stainless steel kitchen sinks became economically feasible only after we helped a manufacturer solve the problem of a perfect color match with a monel gas welding rod.

We still like tough joining problems. That's why we invite you to put your joining problem up to us. We may fail or succeed, but we'll work on it with the best research brains and equipment, and it won't cost you a penny.

Write and tell us what your joining problem is, with the essential details.

Send for a free copy of our 56-page Manual and Catalog.

Distributors everywhere

All-State

ALL-STATE WELDING ALLOYS CO., INC.
White Plains, N.Y. Dial 914 WH 8-4646
QUALITY WITH SERVICE

SPECIAL MONEY-SAVING OFFER!

For Light Welding & Cutting:

NEW PUROX 100 ONE HUNDRED OUTFIT

$114.62 value for only $100.00

YOU SAVE $14.62!

Ideal for light-duty production, repair, maintenance work. Use the PUROX "100" oxy-acetylene outfit on aircraft, small parts, light machinery, sheet metal assemblies. Pocket-sized regulators and compact torch make it extra small, portable (entire unit weighs less than 10 lbs.). Welds up to 3/8", cuts up to 2". Additional heads and nozzles available to extend range. Elimination of metal-to-metal gas seals adds years of useful life.

For Medium Welding & Cutting:

NEW PUROX 130 ONE-THIRTY OUTFIT

$148.07 value for only $130.00

YOU SAVE $18.07!

Meets any shop's medium-range oxy-acetylene needs . . . on production lines, in garages and repair facilities, on pipe welding jobs, in tool, die, maintenance departments. *Easy to use*—no need to re-adjust regulators when you switch jobs. *Reliable*—flame won't sputter or pop regardless of size, valve-throttle or regulator settings. Lightweight, easily portable, economical to buy and use. Welds up to 3/8", cuts up to 4".

Your LINDE Distributor — Where One Call Gets It All

Your nearby LINDE distributor has both these PUROX kits in stock now. For his location, check your Yellow Pages or write Linde Company, Division of Union Carbide Corporation, 270 Park Ave., New York 17, N. Y. *In Canada:* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

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LETTERS

. . . from page 16

re-heat treating after welding. If a weldment demands the high strength of an alloy such as 6061, and is not too large for a furnace, re-heat treatment is a feasible means of increasing as-welded strength. However, in addition to the cost, this process does not restore the full ductility of the welded joint, and may also cause some warping and distortion.

Even with post-weld heat treatment, the ductility of the heat-treatable alloy weld is not as good as that of the work-hardenable alloys in as-welded condition. Consequently, if a fabrication designed for fusion welding is to have the highest possible as-welded strength and ductility, one of the high magnesium alloys is the designer's best selection.

This does not mean that 6061 aluminum is not a recommended and valuable alloy. It is a highly serviceable material, widely used in riveting, resistance welding and fusion welding. However, the designer must understand its weldability limitations, recognizing that if the fabrication may not be re-heat treated, highest weldment strength and fatigue resistance is not obtained with heat-treatable alloys.

Therefore, to attain highest as-weld strength in aluminum structures the designer has for consideration the manganese-manganesium-aluminum alloys such as 5086, 5083, 5454 and 5456.

Howard E. Adkins
Kaiser Aluminum & Chemical Sales, Inc.
Chicago, Ill.

Satisfied customer

Please start my subscription with the May issue of WELDING ENGINEER.

I have a new welder, a Miller Big Twin 250 amp model. I saw it advertised in your magazine.

Edward J. Mrowczynski
South Bend, Ind.

Letters should be addressed to: The Editor, The Welding Engineer, P. O. Box 28, Morton Grove, Ill. No letter will be published unless signed, but your name will be withheld if requested.

MODERN ELECTRONIC ENGINEERING GIVES PRECISE POSITIONING SPEED CONTROL

1/100 — 10 H. P.

Modern industrial electronic engineering has been coordinated with electric motor design to provide a versatile means for obtaining the full possible advantage of speed control in WELDING POSITIONING EQUIPMENT.

PATENTED FEEDBACK, OR "SERVO" CIRCUITS PROVIDE CONSTANT TORQUE CAPABILITY OVER WIDE SPEED RANGES OF AS HIGH AS 60 TO 1 IN SOME MODELS AND A MINIMUM OF 20 TO 1 IN OTHERS.

Servospeed
DIV. of ELECTRO DEVICES, Inc.
4 Godwin Ave., Paterson, N. J.
ARmory 4-8989

Circle No. 197 on Welding Info-Aid Card

VIPS in review...

Richard M. Winkler has been appointed director of customer relations for Susquehanna Sciences, Inc. He will direct the sales activities of the firm's two affiliates, Birdsell Products and Computer Engineering Associates.

Winkler

Hach

Burnell

Okladek

Three men have been appointed to the engineering staff of The Harris Calorific Co., Cleveland. The men are **Frank Hach, Jr,** chief industrial engineer; and **Alfred E. Burnell** and **Joseph J. Okladek,** product engineers.

James A. Browning has been elected president of Thermal Dynamics Corp., Lebanon, N.H. Browning, professor of mechanical engineering at Dartmouth College, is one of the founders of Thermal Dynamics.

John Galandak has been appointed executive vice president of Paterson Boiler & Tank, Inc., Paterson, N. J. Galandak was formerly manager of engineering with Graver Water Conditioning Co., New York City.

—your LINDE distributor!

It takes more than a line of welding equipment to be a LINDE distributor. It takes real knowledge of your welding needs . . . knowledge of local industry . . . practical experience and interest in efficient welding operations . . .

These are some of the qualifications that make your LINDE distributor so valuable to your business. He's a specialist in his field, equipped with a complete stock of welding and cutting equipment, industrial gases, welding rods, supplies, and accessories. They're all products of highest quality and proved efficiency. Your LINDE distributor is ready to help you today, with equipment, expert advice, and the benefits of LINDE's 50-odd years of welding and cutting leadership.

A telephone call will prove the point. Look up your LINDE distributor in the classified directory. Or write to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, New York. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

Your LINDE Distributor

"Where One Call Gets It All"

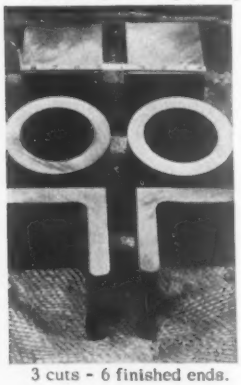
LINDE COMPANY

UNION CARBIDE

"Linde" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

WHAT'S YOUR SHOP COST PER HOUR FOR WAGES AND OVERHEAD?

If it's $6.00 you spend 10 cents per minute.
If it's $7.20 you spend 12 cents per minute.



3 cuts - 6 finished ends.

Cuts like these are made in SECONDS!

$6.00 per hour = 1/6 cents per second.

$7.20 per hour = 1/5 cents per second.

WHEN YOU CAN CUT AND FINISH LIKE THIS (Total time 58 seconds) THAT'S FAST! WHY DON'T YOU INVESTIGATE TO SEE WHAT YOU ARE MISSING.

Write and ask about "Cut-Machining."

WALLACE SUPPLIES MFG. COMPANY
1810 W. Cornelia Ave., Chicago 13, Illinois
or *Check Item* 198 on Card.

NATIONAL CARBIDE TOPS IN QUALITY!

All you want—when you want it in the **RED DRUM.**
All sizes, in quantities from 2 lb. pkgs. to 5 ton hoppers.

Calcium carbide is a product of:

AIR REDUCTION CHEMICAL & CARBIDE CO.
A Division of Air Reduction Company, Incorporated
150 East 42nd St., New York 17, New York, MUrray Hill 2-6700 area code 212

At Air Reduction Sales Co., New York City, **L. J. MacLennan, Jr.** has been made assistant manager of distributor sales in the midwestern region and **J. J. Rendos,** has been appointed assistant manager of the Cryogenic Engineering Department in Plainfield, N. J. MacLennan was formerly assistant manager of distributor sales in the Pittsburgh district and Rendos was supervisor of process and equipment design in the Cryogenic Engineering Department.

MacLennan

Rendos

Merriman

Werly

R. H. Merriman has been appointed manager of the Gas Marketing Department of Air Reduction Sales Co., New York City. He succeeds **G. L. Werly** who has been promoted to general marketing manager for Airco.

Alva Allen Industries, Clinton, Mo., has appointed **James A. Donnelly** as its factory representative in California.

Robert P. Jones, New England division manager of Oakite Products, Inc., New York City, has been assigned to the New York headquarters. He is succeeded in his New England post by **Roger R. Heroux.**

After 30 years of selling and distributing welding supplies in Southern California, **W. E. Archer** of Pasadena has retired.

Amperex Electronic Corp., Hicksville, L.I. N.Y., has promoted Dr. **James McKenzie** to manager of gas tube and semiconductor departments and has named **Kenneth Spitzer** manager of the microwave tube development department. Amperex has also appointed **Selig Gertzis** manager of the tube and semiconductor applications laboratory and has named **Walter Bosse** manager of the quality control department.

McCloud

Eutectic Welding Alloys Corp., Flushing, N. Y., has appointed **George R. McCloud** as Service, Training and Distribution Center Manager for the Pacific Div., Bay Area Branch. He will headquarters in Oakland, Calif.

Jack R. Saddler has been appointed South Atlantic District manager by J. B. Nottingham & Co., Inc., New York City. Saddler was formerly a sales representative for the metallurgical division of P.R. Mallory & Co.

The Gevaert Co. of America, Inc., New York City, has appointed **Claude Maillard** manager of their Industrial Sales Department. He will be responsible for sales of industrial X-ray films, recording materials, microfilm, magnetic tape and scientific films and plates in the United States.

Alan Wood Steel Co., Conshohocken, Pa., has appointed **William T. Geiger** as superintendent of the 110-in. rolling mill — 30-in. hot strip mill and **Robert G. Leister** as superintendent of the hot strip finishing and cold strip mill. **Elias E. Myers, Jr.** has been appointed assistant superintendent of hot strip mill finishing. Alan Wood Steel Co. has also appointed **Augustus D. Lagomarsino** to the position of purchasing agent.

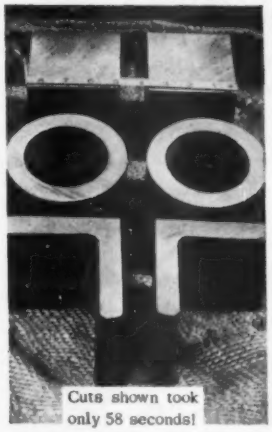
ARE YOU

WORKING OVERTIME TO KEEP YOUR PRODUCTION LINE FULL?

ARE YOU running more than one HACK OR BAND SAW?

Then you cannot afford to remain in the dark.

3 cuts - 6 finished ends.



with WALLACE "CUT-MACHINING."

YOU CAN

CHANGE MINUTES into SECONDS!

Write! Learn how it's done.

WALLACE SUPPLIES MFG. CO.
1810 W. Cornelia Ave.
Chicago 13, Illinois

Or *Check Item* 198 on Card.

BECKER
Keen-Cut
Electrodes

for use in CARBON ARC-AIR JET GOUGING

KEEN-CUTS—for the best characteristics of carbon and graphite in a carbon arc cutting electrode. Higher current capacity . . . longer life . . . shorter cutting time . . . greater material removal . . . smooth surface gouge . . . controllable accuracy . . . hot stable cutting arc . . . elimination of smoke and gases.

And they're low in cost. Try BECKER KEEN-CUT ELECTRODES—black or copper coated, standard diameters, 12" lengths in 150 to 1400 amp. range—for the most efficient, labor-saving electrode in carbon arc/compressed air cutting.

A COMPLETE LINE OF CARBON AND GRAPHITE WELDING SUPPLIES—carbon and graphite electrodes, carbon rods and plates, welding paste, graphite cores and chills, graphite powder and particles of any mesh.

Write for Catalog

BECKER BROTHERS CARBON CO.

3436 South Laramie Ave. • Cicero 50, Illinois

Telephone: BI 2-1260 • Chicago

For more facts Circle No. 201 on Welding Info-Aid Card

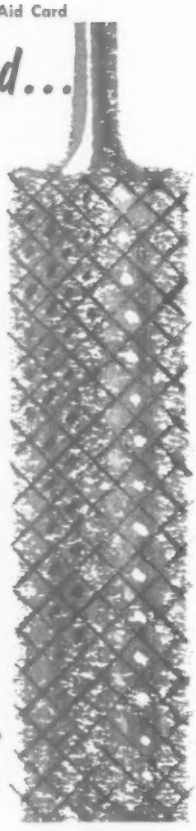
Just tear off your Bandaid...

send it and your old file to:
H & M PIPE BEVELING MACHINE CO.

and we'll know you're interested in finding out more about the H & M "BEVEL-LAND" Grinder. The "BEVEL-LAND" Grinder eliminates time-consuming handwork and assures better quality welds by accurately placing the land on the bevel. The grinder is electric or air powered and is available in two models — one for 6 to 12 inch pipe and one for 14 to 30 inch pipe. Larger models are available on request.

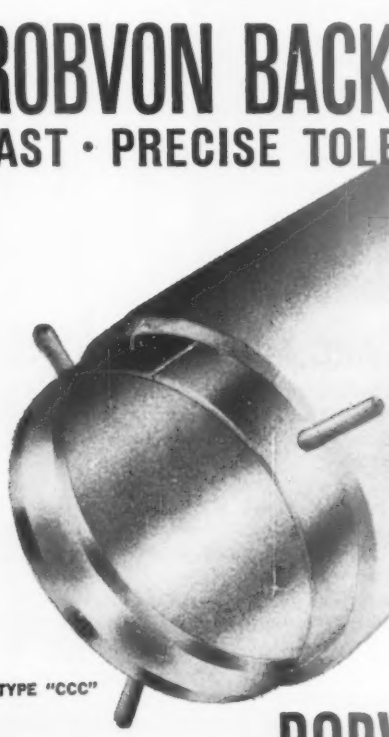
PATENT NO. 2,869,293

PIPE BEVELING MACHINE CO.
T M REG
311 E. Third St. LUther 3-0241
TULSA, OKLAHOMA



ROBVON BACKING RINGS
FAST • PRECISE TOLERANCE FIT-UPS

Designed for quick easy alignment of pipe where the variation in inside diameters is relatively great. Chamfered NUBS allow close tolerance fit-up and CLEAN STRIKE OFF. The ROBVON NUB automatically sets root gap. ROBVON rings are beveled to assure non-restricted fluid flow. Available in Carbon Steel, Wrought Iron, Chrome Alloys, Stainless Steel and Aluminum.



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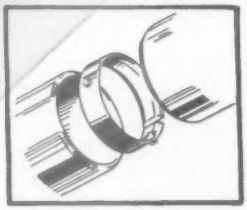

Exclusive with Robvon

ROBVON BACKING RING CO.

Reg. Pat. Nos. 2,764,426 & 2,366,579 675 Garden St., Elizabeth 2, N. J., PH: EL 2-9613

Stanley V. Schumann has been named sales promotion manager for American Brazing Alloys Corp., Pelham, N.Y. He will be responsible for marketing, promotion and advertising of the entire Ambraze line.

Rowland Erving has been named director of marketing research for The McKay Co., Pittsburgh. Erving joined the firm in 1929 and has been sales manager of the Chain Div. since 1958.

Erving

Chaney

Jack Chaney has joined the sales staff of Fibre-Metal Southeast, Inc., Decatur, Ga. Chaney will work with customers in Southern Alabama, Southern Georgia and Florida.

Theodore Pearce has been appointed to the headquarters staff of the National Fluid Power Association, Milwaukee. Pearce was director of college relations and extension services at Michigan Tech before his appointment.

Cecil Miles has been appointed southwestern factory sales representative for Sellstrom Mfg. Co., Palatine, Ill.

Joseph Venerus has been appointed project engineer for ferrites for General Ceramics Div. of Indiana General Corp., Keasbey, N. J.

Clifford H. Shumaker, chairman of the Department of Industrial Engineering of Southern Methodist University, has been named to serve as president of The American Society of Mechanical Engineers.

John N. Vogt has been named vice president in charge of manufacturing for Temperature Engineering Corp., Riverton, N.J.

For more facts Circle No. 202 on Welding Info-Aid Card

Ernest S. Wellhofer has been appointed manager of the Monessen, Pa., plant of Page Steel and Wire Division of America Chain & Cable Co., Inc.

National Cylinder Gas Div., Chemetron Corp., Chicago, has appointed seven new dealer representatives in six districts. **G. P. Zielke** and **R. J. Eisler** were named to the Chicago district; **N. P. D'Alessandro, Jr.,** Boston district; **H. B. Stormer,** Buffalo district; **F. J. Gordon,** Cleveland district; **K. W. Clemen,** Philadelphia district; and **R. C. Weiss,** St. Paul district.

J. P. Levis, chairman of the board of Owen-Illinois Glass Co., Toledo, has been elected a director of Gregory Industries, Inc., Toledo.

Joe S. Kirk has joined National Electronics, Inc., Geneva, Ill., as manager of commercial engineering.

Raymond C. Kendall has been appointed sales manager of National Ultrasonic Corp., Nutley, N. J. Kendall will be responsible for national sales and distribution of ultrasonic cleaning equipment.

William R. Mogg, formerly assistant director of product development, has been appointed assistant technical services director of metallurgy with Crucible Steel Co. of America, Pittsburgh.

Eugene Small has been appointed vice-president of Weltronic Co., Detroit. Small will continue as general manager of the Weltronic Co., Canadian Div., Windsor, Ontario.

Died . . .

William Kelvin Sproule, 48, consulting metallurgist with the Development and Research Div. of The International Nickel Co., Inc., died in New York recently. Mr. Sproule, who joined Inco in 1937, is survived by his widow and three children.

V. Kynett, owner of Kynetts Welding in Alliance, Ohio, died recently in Alliance.

For more facts Circle No. 203 on Welding Info-Aid Card

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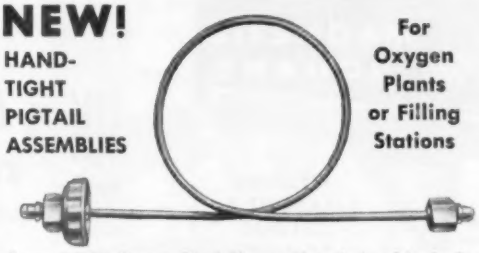
For Oxygen Plants or Filling Stations



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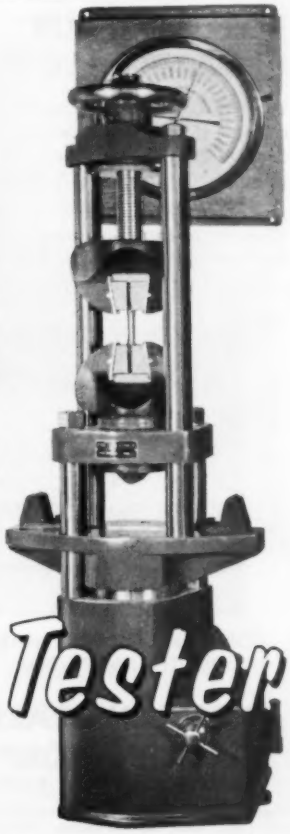

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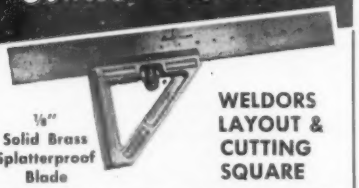
THE Combo MAGNETIC SQUARE



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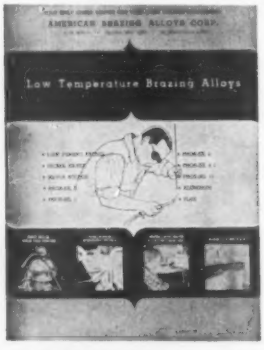

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Book reviews...

Engineering research

ENGINEERING COLLEGE RESEARCH REVIEW, 1961. Edited by Paul T. Bryant and John F. Penn. Published by American Society for Engineering Education, University of Illinois, Urbana, Ill. Price $4.

According to this biennial review, over 11,000 research projects are in progress in 121 leading engineering colleges throughout the United States.

The survey gives complete titles for all projects under way in schools which hold ECRC membership. It also lists the number of persons engaged in research at each institution and the research policies of the various institutions.

Tensile properties

REVIEW OF CURRENT DATA ON THE TENSILE PROPERTIES OF METALS AT VERY LOW TEMPERATURES. By J. E. Campbell. Published by Defense Metals Information Center, Battelle Memorial Institute, Columbus 1, Ohio, 76 pages. Price $2.

Low temperatures (-423 F) and their effects on tensile property are fully discussed in relation to aluminum alloys, copper base alloys, magnesium alloys, nickel and cobalt-base alloys, low alloy steels, stainless steels, tantalum and columbium, and titanium-base alloys. Charts are included.

Also included in the review are strength ratios and elastic constants at low temperatures.

Employee motivation

THE HUMAN TOUCH IN MANAGEMENT. Published by Motivation, Inc., Springdale, Conn. By Cloyd Steinmetz, 24 pages. Price 25¢.

Designed for foremen and supervisors, this book tells how to motivate employees through an understanding of basic principles of human relations.

The author is sales training director for Reynolds Metals Co.

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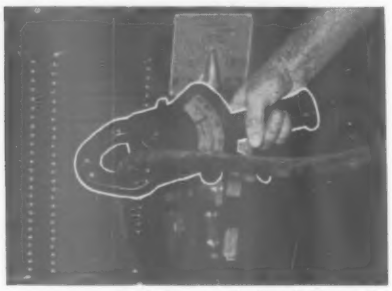

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Beryllium

Six beryllium publications published by Office of Technical Services, U.S. Department of Commerce, Washington, D.C.

Six books are available from OTS on beryllium. Three are on joining, one is on beryllium research, one is on beryllium crack propagation, and two are annotated bibliographies on beryllium research.

The publications are:

BERYLLIUM JOINING WADC SPONSORED PROGRAM. by E. M. Passmore. 127 pages. Price $2.75.

BERYLLIUM JOINING RAD SPONSORED PROGRAM. by J. B. Cohen. 45 pages. Price: $1.25.

BERYLLIUM RESEARCH AND DEVELOPMENT IN THE AREA OF COMPOSITE MATERIALS. by J. Greenspan and others. 121 pages. Price $2.75.

BERYLLIUM CRACK PROPAGATION AND EFFECTS OF SURFACE CONDITIONS. by C. O. Matthews. 197 pages. Price: $3.

BERYLLIUM: SURVEY OF LITERATURE. by K. D. Carroll. 59 pages Price: $1.50.

BERYLLIUM: A SEARCH OF THE LITERATURE 1957-1959. by K. D. Carroll. 113 pages. Price $2.50.

Metals standards

1960 SUPPLEMENTS TO BOOK OF ASTM STANDARDS. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Part I, 444 pages; Part II, 348 pages. Price $4 (per part).

Part I covers ferrous metals specifications and includes 63 standards on steel pipe, tubes, castings, bolting materials, boiler plates, sheet and strip, bars, forgings, chain, corrosion and heat-resisting steel. Also structural steel, coated and iron products, wrought iron, cast iron, ferro-alloys, titanium alloys, zinc coated steel, metal powder products and steel rails are covered.

Part II covers non-ferrous metals specifications and electronic materials. It includes 57 standards for copper and copper-base alloys, ingot, plate, sheet, strip, rolled bar, shapes, wire, die forgings, pipe and tubes.

It also includes solder metal, zirconium, lithium, materials for electron tubes and semi-conductor devices, metal powders and metallic coatings.

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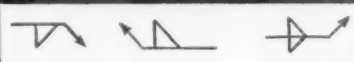

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Electron tube techniques

ADVANCES IN ELECTRON TUBE TECHNIQUES. Edited by David Slater. Published by Pergamon Press, Inc., 122 E. 55th St., New York 22, N.Y., 235 pages. Price $15.

Contents of this hard cover volume consist of articles based on the proceedings of the Fifth National Conference on Tube Techniques.

One article, on welded connections in electron devices, is based on a research project conducted by Battelle Memorial Institute.

Beryllium properties

MECHANICAL PROPERTIES OF BERYLLIUM. PB 171 411 Published by OTS, U. S. Department of Commerce, Washington 25, D. C. By A. E. Risen and R. T. Ault, 1960, 37 pages. Price $1.

This study of the mechanical properties of beryllium was undertaken on both hot pressed and hot pressed-hot extruded material.

Test procedures included tensile, torsion, pin shear, creep rupture and fatigue data. Material showed surprising strength under fatigue loading conditions.

Plant engineering

TECHNIQUES OF PLANT MAINTENANCE. 12th volume. Published by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N.Y. 349 pages. Price: $10.

This annual volume is a verbatim report of the Plant Maintenance & Engineering Conference held in January.

Included in the book are 37 papers, illustrated by 114 charts, diagrams and tables and supplemented by discussions of 607 audience-presented questions.

Crack arrestors

BEHAVIOR OF RIVETED AND WELDED CRACK ARRESTORS. By R. J. Mosborg. Published by Office of Technical Services, U.S. Department of Commerce Washington 25, D. C. 114 pages. Price $2.75.

This Navy research report gives results of laboratory-propagated notch crack tests on steel plates 2-ft and 6-ft wide containing welded inserts of T-1 steel, riveted doubler plates, and welded inserts of ABS Class C normalized steel.

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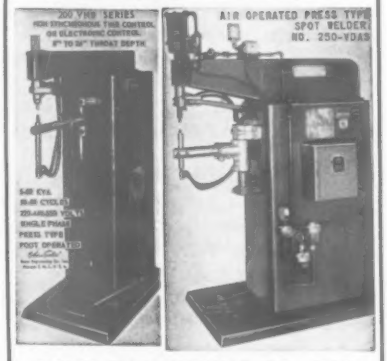

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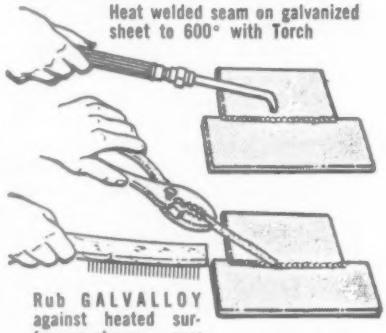

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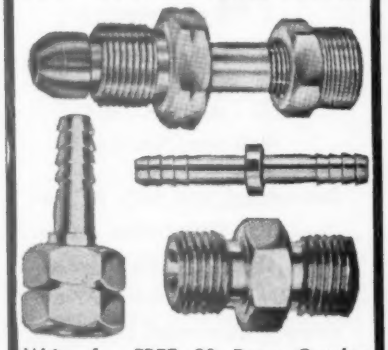

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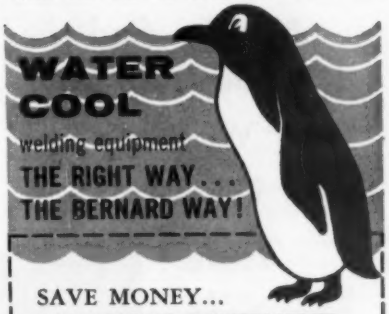

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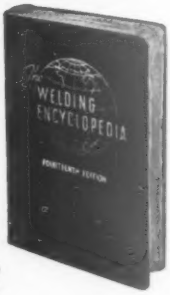

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In retrospect

Taken from **Welding Engineer** issues of October, 1916, 1931 and 1946

—45 Years Ago—

The medical schools experience no more trouble in securing the necessary cadavers, upon which students practice the gentle art of dissection, than do welding schools in securing a diversified supply of broken machines and parts, the repair of which will make a weldor. There is this slight difference: should the medical student make the unimportant mistake of removing the liver instead of the appendix, no serious harm is done. The student is merely lectured for carelessness. Should a student of welding, however, melt down an aluminum crankcase, left for repairs by some trusting owner, it's another matter. The subject's relative — so to speak — is apt to insist upon satisfaction, and he is also apt to blame it all on the welding system.

—30 Years Ago—

Machinery & Welder Corp. has been organized in Chicago, with offices at 2604 N. Cicero Ave. The firm, headed by President F. P. Kohlbry, formerly of Halpin-Kohlbry Inc., of St. Louis, will distribute General Electric arc welding equipment and accessories.

—15 Years Ago—

The Glenn-Roberts Co., manufacturer of a-c welders has moved its general offices from Oakland, Calif., to Indianapolis, Ind. Expansion plans are also in the offing.

J. Donald Zaiser has been elected president and general manager of Ampco Metal, Inc., Milwaukee, succeeding his late father, Carl J. Zaiser. F. E. Garriott, development manager for welding electrodes at Ampco, has assumed duties of manager of weldrod sales.

Howard B. Cary has joined the staff of Battelle Memorial Institute, Columbus, Ohio.

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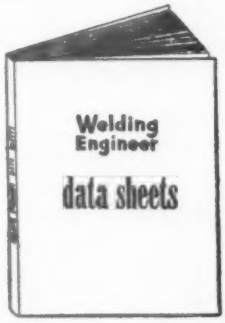

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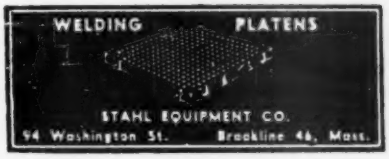

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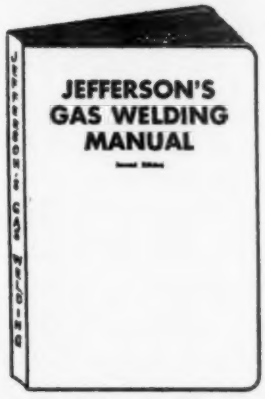

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PROTECTIVE EQUIPMENT — National Cylinder Gas Division. Illustrated 20-page catalog, N-177, shows personal protective equipment for welding and cutting including helmets, goggles, screens, gloves and hats.
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FILMBADGE PROCESSING — St. John X-Ray Laboratory. Four-page pamphlet tells about filmbadge service for monitoring personnel exposed to radiation hazards.
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PROTECTIVE CLOTHING, GLOVES — Elliott Glove Co., Inc. Two-color 8-page catalog includes sizes, illustrations of capes, coats, aprons, sleeves, gloves and other protective accessories for welding.
Circle No. 79 on Info-Aid Card

WELDING HELMETS — The Fibre-Metal Products Co. Bulletin No. 73 four pages, describes welding helmets with a new headgear.
Circle No. 80 on Info-Aid Card.

FILTER UNITS — Vac-U-Max. Sheet No. 110 describes filter units for safe recovery of radioactive and toxic materials.
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HAZARD HUNTING—National Safety Council. Ten-page illustrated booklet tells employees how to hunt down and destroy hazards that cause accidents. This lowers absentee rates caused by accidents.
Circle No. 82 on Info-Aid Card.

OXYGEN BREATHING EQUIPMENT — Rockwood Sprinkler Div. Form 20M-8-60 explains the working of self-contained oxygen breathing equipment for emergency use.
Circle No. 83 on Info-Aid Card.

LONGITUDINAL POSITIONERS — Airline Welding and Engineering. Illustrated Bulletin AW-11-60 illustrates and explains longitudinal welding positioners.
Circle No. 84 on Info-Aid Card.

ELECTRODE HOLDERS — Tweco Products, Inc. Two electrode holders designed to eliminate heat problems by means of double ball-point cable connections are described and illustrated in Form No. 1438-HD.
Circle No. 85 on Info-Aid Card.

PIERCING ELECTRODES — Stulz-Sickles Co. One-page sheet gives applications and procedures for using electrodes made for cutting, gouging, channeling and piercing.
Circle No. 86 on Info-Aid Card.

PIPE WELDER — Air Reduction Sales Co. Four-page brochure (ADC 927) on Automatic CO_2 Mig pipe welder (described in WELDING ENGINEER, April, page 66) is a liberally-illustrated coverage of the unit.
Circle No. 87 on Info-Aid Card.

HARDFACING ELECTRODE — The McKay Co. Data Sheet No. B gives a description, operational characteristics, mechanical properties, composition and applications of hardfacing electrode for overlays subject to metal-to-metal wear or severe earth scouring.
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STEEL WELDING — Alloy Rods Co. "Handbook for Welding Low Alloy High Tensile Steels" is a 64-page reference guide for the fabricator. Electrode recommendations for welding trade name steels and hundreds of others are included.
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ARC WELDING NEWS — Hobart Bros. Co. Sixteen-page issue of Arc Welding News (AWN 167) includes article on automatic field welding pipe.
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POSITIONING — Aronson Machine Co., Inc. Section 8 of "Positioneering" is a 28-page article on welding positioners with specifications on 1,000 to 24,000-lb-capacity models.
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ACETYLENE CYLINDER — Coyne Cylinder Co. Cylinder-shaped fold-out card gives specifications of a 1,000-cu.-ft.-capacity acetylene cylinder.
Circle No. 92 Info-Aid Card.

SPOT WELDER — Duro-Dyne Corp. Portable spot welder is shown and explained in WAA-8-7.
Circle No. 93 on Info-Aid Card.

GAS CYLINDERS—Pressed Steel Tank Co. Compressed gas cylinders for oxygen, argon or carbon dioxide are fully described in this 26-page catalog which includes specifications, sizes and applications.
Circle No. 94 on Info-Aid Card.

SOLDERING FLUXES — Lake Chemical Co. Fold-out pamphlet No. 113 describes firm's stainless steel and chrome flux, aluminum flux, silver solder flux, electro flux and all-purpose flux.
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WELDING POSITIONER — Metals Bonding Co. Sheet describes Model BP-1 welding positioner for jobs up to 100 lb.
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AUTOMATIC FUSION WELDING — Sciaky Bros., Inc. Comprehensive 56-page book gives complete information on fully-automatic fusion welding equipment with building block or modular concept.
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ROLLER, IDLER REBUILDER — Automatic Welding Co. Four-page Bulletin MI-402 gives full specifications and photos of dual-head automatic roller and idler rebuilder.
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CLAMPS — Wetzler Clamp Co., Inc. Catalog No. 61 is an 8-page illustrated listing of a variety of clamps including pipe clamp fixtures, C clamps, and welding clamps.
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MULTI-GUN WELDERS — The Federal Machine and Welder Co. Tips and Dies Vol. 4, No. 1, 4 pages in color, describes and illustrates 14 multi-gun welders for mass producing specific fabricated parts.
Circle No. 100 on Info-Aid Card.

TUNGSTEN ELECTRODES — Wah Chang Corp. Three-page discussion of tungsten electrode specifications includes classifications, sizes and lengths.
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MOTOR SPEED CONTROL — Electro Devices Inc. Illustrated 8-page booklet tells what motor speed controls are, how they work, what they do. Several models are described.
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Literature offered in advertisements which were received up to the 5th of last month. To get the literature you want circle numbers on fold-out card at right.

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206. **American Brazing Alloys Corp.** — Catalog available, "Low Temperature Brazing Alloys".

159. **American Platinum & Silver Div.** — "A Complete Guide to Sccessful Silver Brazing" is available.

153. **Ampco Metal, Inc.** — Additional information is available on "Ampco-Braz" filler rods.

220. **Anti Borax Compound Co., Inc** — Literature and sample of "Braz-Cast Flux" No. 4 for bronze welding and cast iron repair.

192. **Aronson Machine Co., Inc.** — Detailed engineering data available on Aronson "TracTred" Turning Rolls and other positioners manufactured by Aronson.

186. **Auto Crane Co.** — Write for illustrated literature, specifications and price lists on all models of Auto Crane.

164. **The Bastian-Blessing Co.** — Catalog No. G300-GA available on the "RegO" 600 series cylinder valves.

200. **Becker Brothers Carbon Co.** — Catalog on Becker "Keen-Cut" electrodes and carbon and graphite welding supplies, is available.

217. **Bernard Welding Equipment Co.** — Pamphlet available, "The use of Water Cooling for Welding Equipment."

172. **Cam-Lok Div.** — Catalog on plugs, connectors, and receptacles is available.

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207. Columbia Electric Mfg. Co. — Catalog WE-400 is available on the Tong-Test Ammeter to get the exact amperage for your welding job.

204. Detroit Testing Machine Co. — Catalog sheets and prices on strength testing machines manufactured by Detroit Testing Machine Co.

154. Dockson Corp. — Detailed literature on the new Dockson gaugeless regulators for every purpose is available.

219. Engwald Corp. — Descriptive catalog on Engwald exhaust systems available.

184. Hamilton - Electrona, Inc. — Metallurgical data on Hamilton-Zeiss electron-beam welding equipment is available.

151. Hobart Brothers Co. — Data sheet A-133-E is available on the new "Lowboy" welder.

190. International Nickel Co., Inc. — A copy of the Inco-Weld "A" Electrode folder is available explaining where and how it is being successfully used.

156. Jackson Products — Catalog available on welding and safety equipment manufactured by Jackson.

212. Lenco, Inc. — Chart showing Arc, gas and resistance welding symbols is available.

209. Markal Co. — Literature available on "Thermomelt" temperature indicators and sample pellet.

182. Metal & Thermit Corp. — An "Electrode Selector" is available on M&T Murex electrodes including, Low Hydrogen, Iron Powder and Stainless Steel electrodes.

173. Miller Electric Mfg. Co. — Pamphlet, "Rectifiers For Welding" available and further information on the "Six Pak" comprised of six Gold Star SRH-444 rectifier type d-c welders.

158. National Cylinder Gas — Catalog N-177-E-2K available on the proper kind of protection for your welding, brazing and cutting jobs.

216. Oxo Welding Equipment Co. — Catalog available describing Oxo welding fittings.

178. Pressed Steel Tank Co. — Hackney cylinder catalog available, gives up-to-date information for your cylinder needs.

166. Tuffaloy, Air Reduction Sales Co. — Write for independent laboratory test results on the new Double-Barrelled tip Holder and Tuffaloy catalog.

203. Western Enterprises, Inc. — Catalog, "Welding Connections" contains 200 fitting illustrations and prices, also catalog supplement 61-2 available.

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